Validation of a Contemplation Ladder in an Adult Substance Use Disorder Sample

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Abstract

Developing brief measures of motivation to abstain from substance use that reliably predict treatment retention and outcome is a high priority in the addiction field. This study examined the psychometric properties of a contemplation ladder designed to assess readiness to abstain from alcohol and drug use respectively, based on the contemplation ladder for smoking cessation developed by Biener & Abrams (1991). Participants were 394 substance-using male and female welfare recipients referred for treatment. The combined alcohol and other drug (AOD) ladder showed discriminant validity with demographic and health characteristics, convergent validity with conceptually related treatment motivation variables, concurrent validity with baseline AOD treatment and substance use variables, and predictive validity for participation in treatment services up to one month later and abstinence outcomes up to one year later. The AOD ladder showed predictive validity for those in drug-free treatment and no treatment at baseline but not for those in methadone maintenance.

Keywords

readiness to change; contemplation ladder; adult substance use; predictive validity

Motivation to change problematic behavior is considered a key element of client readiness for treatment and ability to benefit from treatment services. Readiness to change, and specifically motivation to engage in treatment, are thought to be especially important for substance users, for whom denial of addiction problems and ambivalence about treatment participation represent major barriers to treatment success (Miller & Rollnick, 2002). Developing measures that reliably assess baseline readiness to change and also predict treatment retention and outcome is a high priority in the addiction field.

Contemplation ladders (Biener & Abrams, 1991; Rustin & Tate, 1993) are a promising method for assessing readiness to change in substance using populations. Contemplation ladders are single-choice, visual analogue scales that depict a ladder whose higher rungs represent greater levels of readiness to change. Contemplation ladders are rooted in the stages of change framework (Prochaska, DiClemente, & Norcross, 1992), which postulates a five-stage developmental sequence of behavior change: precontemplation, contemplation, preparation, action, and maintenance. However, ladders do not categorize individuals into one of five

discrete stages. Instead, they provide a single continuous metric of motivation and/or readiness to change problematic behavior (Biener & Abrams, 1991; Slavet et al., 2006).

Contemplation ladders have demonstrated strong reliability and validity properties for smoking cessation (Amodei & Lamb, 2004; Carey, Punine, Maisto, & Carey, 1999; Martin, Rohsenow, MacKinnon, Abrams, & Monti, 2006; Rustin & Tate, 1993). They have also shown convergent validity with multi-item stages of change measures in both adult (Amodei & Lamb, 2004) and adolescent (Stephens, Celluci, & Gregory, 2004) smokers. In one of very few ladder studies involving adult substance users, LaBrie, Quinlan, Schiffman, and Earleywine (2005) showed that an alcohol ladder was comparable to a multidimensional stages of change measure in correlating with intentions to use alcohol among problem-drinking college students. And Harris, Walters, and Leahy (2008) showed convergence between a multi-item stages of change measure and a single-item, 11-point Likert-type scale ("ruler") measuring the importance of changing drinking behavior among heavy-drinking college students.

Contemplation ladders therefore have several advantageous properties: solid psychometric properties in smoking populations, convergent validity with multi-item stages of change measures among college drinkers, and a single-item format that is easy to administer and interpret. For these reasons, they have great potential utility as robust and cost-efficient assessment tools within various drug treatment settings and other sectors of care (Blanchard, Morgenstern, Morgan, Labouvie, & Bux, 2003). However, only a handful of studies have tested the ladder method in alcohol and drug samples. Bluthenthal, Gogineni, Longshore, and Stein (2001) found that a ladder assessing readiness to change drug use did not predict recent participation in a needle-exchange program. Slavet and colleagues (2006) showed that a marijuana ladder had both concurrent and predictive validity (including future treatment engagement and marijuana consumption) in incarcerated adolescents. Perhaps the strongest validity data for drug use have been reported King and colleagues (2009), who demonstrated that adolescent readiness to change marijuana use predicted six-month reductions in use over and above baseline severity of use and the effects of treatment utilization.

Study Hypotheses

Despite these promising advances, there is little available research on the validity of the ladder method for alcohol and other drugs (AOD). The current study examined the construct validity of a contemplation ladder developed to assess readiness to abstain from alcohol and drug use by conducting the four main types of related validity analyses: discriminant, convergent, concurrent, and predictive validity (Bryant, 2000; Kazdin, 1992). The ladder format was adapted from the Biener and Abrams (1991) contemplation ladder for smoking cessation and administered to a large sample of substance-using welfare applicants participating in a practical clinical trial of coordinated care management (Morgenstern, Hogue, Dauber, Dasaro, & McKay, 2009). The study sample included a large, heterogeneous sample of alcohol and drug users involved in various treatment settings at baseline: drug free treatment, methadone maintenance, or no treatment at all. Main study hypotheses were that the AOD ladder would show (a) normal distributions in this heterogeneous sample of substance users, (b) discriminant validity among baseline demographics and health characteristics, (c) convergent validity with other treatment motivation variables, (d) concurrent validity with baseline treatment status and substance use, and (e) predictive validity for treatment participation and substance use up to one year after baseline.

Method

Study Context

We examined the psychometric properties of the modified alcohol and other drug (AOD) contemplation ladder in the context of a practical clinical trial of care management for substance-using welfare applicants. Applicants exhibited a variety of co-occurring problems in mental health, physical health, legal, housing, and child welfare domains, and about half were already enrolled in SUD treatment at baseline (Morgenstern, Hogue, Dasaro, Kuerbis, & Dauber, 2008). The 421 trial participants were assigned to either coordinated care management (CCM), a continuity-of-care intervention focused on engaging clients in SUD treatment, linking them directly to needed ancillary services, and fostering transition to employment; or usual care (UC), a screen-and-refer intervention focused on assessing clients for substance use and related problems and referring needy clients to available community services. Trial results showed that for those not enrolled in methadone maintenance, CCM clients received more SUD treatment and ancillary services than UC clients and showed higher abstinence rates that emerged early in treatment and were sustained throughout follow-up (Morgenstern et al., 2009). Also, among women only, CCM increased rates of employment over time while UC remained stable at low employment rates, with greater treatment attendance and abstinence levels during the first six months of CCM predicting greater employment at one year (Morgenstern, Hogue, Dauber, Dasaro, & McKay, in press). A total of 394 trial participants (94%) completed all measures necessary for inclusion in the current study.

Participants

Participants (N = 394) were primarily men (67%) and either African American (49%) or Hispanic (43%). The sample averaged 39.8 years of age (SD = 8.5). Most were not married (92%), and 54% percent graduated high school or received an equivalency diploma. About 20% reported unstable living conditions and 47% were involved in the criminal justice system. Severity and chronicity of substance use were high: at baseline the sample reported using alcohol or drugs on more than half the days of each month, and participants averaged 9.7 (SD = 11.1) years of regular heavy alcohol use and 10.4 (SD = 8.9) years of regular heroin or cocaine use. Some (15%) reported no prior-month substance use at baseline but had used in the previous 6 months. At baseline 29% were enrolled in drug-free AOD treatment only, 26% were in methadone treatment only or in combination with drug-free treatment, and 45% were not in any AOD treatment.

Due to time constraints at baseline, data on current DSM-IV psychiatric diagnoses (American Psychiatric Association, 1994) were collected at 3-month follow-up for 315 participants (75% of the sample) using the *Mini International Neuropsychiatric Interview* (Sheehan et al., 1998). A total of 78% met DSM-IV criteria for any substance use disorder: 59% for substance dependence and 8% for substance abuse (primary drug was cocaine for 55%, heroin 33%, and marijuana 11%); 36% for alcohol dependence and 10% for alcohol abuse. Also, 23% met criteria for a depressive disorder, 22% for an anxiety disorder, and 25% for antisocial personality disorder.

Study Procedures

Study procedures for condition assignment, screen and baseline interviews, and follow-up interviews are detailed elsewhere (Morgenstern et al., 2009). Condition assignment occurred via a computerized allocation system that tracked program openings in each condition; a check of administrative data during the three months prior to the start of data collection found no significant differences between conditions on more than 20 demographic, welfare, or treatment-related variables, and no differences in show rates for intake appointments. Across study conditions, research assistants approached 1685 welfare applicants and offered the

opportunity to participate in a brief research interview. Among these, 1519 applicants completed the study eligibility screen, and of these, 543 (36%) met the following eligibility criteria designed to identify persons most likely to benefit from intensive case management: At least one day of illicit drug use or heavy drinking in past month, or one day of illicit drug use or heavy drinking in past six months and currently motivated to attend treatment; Not hospitalized for mental health problems more than once in past year; Not currently experiencing psychotic symptoms or prescribed antipsychotic medication; Not residing on the streets, in shelters, or in imminent danger of being homeless; Not planning to move from the area for six months. Of these study-eligible applicants, 421 (78%) consented to participate in follow-up interviews at 1, 3, 6, and 12 months postbaseline. Study refusal rates did not differ between condition for the screen or follow-up sample. Of the 421 follow-up participants, 27 (6%) did not provide data at any follow-up point, leaving 394 participants (221 CCM, 173 UC) included in current study analyses; the follow-up rate did not differ between conditions. Participants received product vouchers after each study interview ($30 for baseline and $50–$75 for follow-up interviews). The study was conducted under approval by the governing Internal Review Board.

Measures: Baseline Characteristics

Demographics and other characteristics—The following variables were obtained via structured interview procedures: gender, ethnicity (African American, Hispanic, Other), age, marital status, years of education, welfare experience (0 = Less than 3 months, 1 = 3 months to 2 years, 2 = 2 to 5 years, 3 = 5 years or more), employment history in past three years (1 = No work, 2 = 1–6 months, 3 = 7–12 months, 4 = 13–24 months, 5 = More than 24 months), housing status (0 = Unstable housing (i.e., living with others and cannot stay longer than 6 months, currently homeless, or living in a shelter or treatment center), 1 = Stable housing), legal involvement (0 = Arrested or incarcerated in past year, or currently on probation or parole, 1 = None), and current (past six months) child welfare involvement (yes or no).

Substance use and health—The following was obtained via structured interview: psychiatric treatment utilization (0 = Used psychiatric medications and/or psychiatric hospitalization in past year, 1 = None,) and number of prior AOD treatment episodes. Current AOD treatment status (0 = Not in outpatient drug-free treatment, 1 = In outpatient drug-free treatment) and composite problem severity scores for alcohol use and drug use during the past 30 days were collected using the *Addiction Severity Index* (ASI, 5th edition: McLellan, Kushner, et al., 1992). Summary scores for physical health status and mental health status were derived from the *Short Form–12 Version 2* (SF-12; Ware, Kosinski, Turner-Bowker, & Gandek, 2002), a well-validated self-report measure of health status during the past month.

Measures: Motivation Variables

Contemplation Ladder for Alcohol/Contemplation Ladder for Drugs—We adapted the *contemplation ladder* for smoking (Biener & Abrams, 1991; Rustin & Tate, 1993) to assess readiness to abstain from drinking alcohol and using illegal drugs, respectively. The contemplation ladder is a measure of readiness to quit smoking based on the stages of change model that characterizes readiness to change as a progression through precontemplation, contemplation, action, and maintenance phases (Prochaska et al., 1992). It has shown strong intercorrelations between different reporting formats (range Pearson's r = .82 – .98; Rustin & Tate, 1993) and also convergent, concurrent, and predictive validity with stated intentions to quit smoking and previous quit attempts (Biener & Abrams, 1991) and with established measures such as the timeline follow-back interview (Sobell & Sobell, 1996) for days of substance use (Slavet et al., 2006) and the URICA multidimensional scale (Amodei & Lamb, 2004). Two separate versions of the contemplation ladder were constructed to measure readiness to stop using (1) alcohol and (2) illegal drugs during the past 30 days. Response

choices on the alcohol and drug ladders ranged from 1 to 7, with the following anchors: 1 = *I do not have a problem with drinking [drugs], and I do not intend to cut down*; 2 = *I might have a problem with drinking [drugs], but I do not intend to cut down or quit now*; 3 = *I am thinking about cutting down on my drinking [drug use], but I am not thinking about quitting drinking [drug use] altogether*; 4 = *I am thinking about quitting drinking [using drugs] altogether, but I still have not made any definite plans*; 5 = *I am close to making a decision to quit drinking alcohol [using drugs]*; 6 = *I have decided to quit drinking alcohol [using drugs], at least for now*; 7 = *I have decided to quit drinking alcohol [using drugs] and plan never to drink [use drugs] again*. Administration time is 2–3 minutes.

Participants completed the alcohol ladder if they reported having three or more drinks in one sitting in the past six months; they completed the drug ladder if they reported using any illegal drugs in the past six months. At baseline, 59 (15%) participants completed the alcohol ladder only, 98 (25%) completed the drug ladder only, and 237 (60%) completed both ladders. Except for the correlations presented in Table 2, all study analyses used a single "combined ladder" score. The combined AOD contemplation ladder was calculated as follows. For participants who completed both ladders, the ladder score corresponding to the more severe problem (based on the higher ASI composite score) was selected for analysis.

There are two reasons for testing a combined AOD ladder score: clinical utility and research utility. The clinical utility of the combined score derives from the fact that substance users who populate treatment programs and other sectors of care are heterogeneous with regard to substance of choice (see Morgenstern et al., 2008 for a recent example from welfare settings). That is, some abuse alcohol only, some abuse illegal drugs only, and some abuse both to varying degrees. By calculating a combined ladder score, treatment providers can derive a single readiness score for each client across all substance use profiles to assist in case planning, program planning, and program evaluation. Of course, the AOD ladder method also allows providers to log two separate readiness scores—one for alcohol, one for drugs—for each client if desired. The research utility of the combined score lies in the ability to examine substance users of any profile in a single group using a common metric, which boosts analytic power and study generalizability. For completeness, the current study reports on the psychometric properties of the individual alcohol and drug ladders as well as the combined ladder.

In the current study, of the 237 who completed both ladders, 138 (59%) had a higher ASI composite score for alcohol use and 81 (34%) had a higher ASI composite score for drug use. The remaining 18 participants had equivalent ASI composite scores for alcohol and drug use; their individual ladder scores were selected based on self-report of primary problem (3 alcohol, 15 drug). The final combined AOD ladder variable used for validity analyses consisted of 200 alcohol ladder scores (51%) and 194 drug ladder scores (49%).

Motivation to quit using substances—Motivation to quit using substances was assessed with four separate questions pertaining to alcohol and drug use, respectively. These items were used in a previous study to measure intentions to abstain from alcohol and drug use (Carey et al., 1999). Three questions asked participants to rate aspects of their intentions to abstain from consuming alcohol/drugs using an 11-point Likert-type scale ranging from 0 (lowest intention) to 10 (highest intention): *How strong is your desire to quit drinking/drug use at this time? How difficult do you think it will be to quit your drinking/drug use at this time? How successful do you expect to be in quitting your drinking/drug use at this time?* These questions were administered to those who reported consumption of any alcohol/illegal drugs in the past 30 days. The questions about difficulty of quitting and expectations for success were administered only to those who reported a score greater than 0 to the first question about desire to quit. Single-item assessments of motivation-related constructs such as intention to abstain (e.g., LaBrie et al., 2005), perceived difficulty of abstaining (e.g., King et al., 2009), and confidence

in abstaining (e.g., Harris et al., 2008) have been commonly used in research on readiness to change substance use and on the whole have demonstrated adequate psychometric properties (Carey et al., 1999). A fourth motivation variable was taken from the ASI (McLellan et al., 1992) and used a 5-point Likert-type scale (0–4): *How important to you now is (additional) treatment for alcohol/drug problems?* This question was administered to participants who reported at least one problem day in the past 30 related to alcohol/drugs. For each participant, either the four alcohol motivation scores or drug motivation scores were used in study analyses, whichever matched the score used for the combined ladder (see above).

Measures: Long-Term Substance Use Variables

Percent days abstinent (PDA)—Percentage of days abstinent per month from alcohol and drugs was measured for one month prior to baseline and for each month over the 1-year follow-up period using the Timeline Follow Back (TLFB; Sobell & Sobell, 1996). The TLFB is a structured interview that involves constructing a retrospective daily record of substance use over a fixed interval using calendars and critical marker events as memory aids. The technique has demonstrated good reliability and validity for substance-using adults (Sobell, Brown, Leo, & Sobell, 1996). The TLFB was also used to document periods of time during which respondents were in controlled environments (e.g., treatment centers, jails); abstinence rates were not calculated for these periods. The percent days abstinent (PDA) variable used in study analyses pertains to both alcohol and drugs. Note that self-report data from the TLFB was verified in this study sample by two biological measures: urine screens and hair samples analyzed using radioimmunoassay tests followed by mass spectrometry confirmation. Biological procedures confirmed the validity of the TLFB data (Morgenstern et al., 2009).

AOD problem days, AOD services received, and Days in treatment—The ASI (McLellan et al., 1992) was used to measure number of days in drug-free treatment in the prior month and number of reported problem days due to alcohol/drug use. A modified version of the *Treatment Services Review* (TSR; McLellan, Alterman, Cacciola, Metzger, & O'Brien, 1992), a companion instrument to the ASI (McLellan et al., 1994, 1998), was used to indicate whether any AOD treatment services (e.g., counseling sessions, medication appointments) were received in the past 30 days. The ASI and TSR were administered at 1, 3, 6, and 12 months follow-up.

Results

Preliminary Inspection of Study Variables

Prior to conducting main study analyses, preliminary inspection of variable distributions were conducted on the alcohol ladder and drug ladder scores separately, as well as on the combined score used in all subsequent analyses. Table 1 provides the distribution of scores across the seven rungs of the alcohol ladder (N = 296), drug ladder (N = 335), and combined ladder (N = 394). The frequency distributions were similar across the three versions, with the largest number of scores placed on the highest rung (7: *I have decided to quit drinking/using drugs and plan never to drink/use drugs again*) for each of the three ladders. The alcohol ladder had a mean score of 4.32 (SD = 2.11), and the drug ladder had a mean score of 5.43 (SD = 1.59). Skewness and kurtosis were −.29 (SE = .14) and −1.21 (SE = .28) for the alcohol ladder and −.89 (SE = .13) and .15 (SE = .27) for the drug ladder, indicating that both variables were near normally distributed. As shown in Table 2, scores on the alcohol and drug ladders were positively correlated (*r* (237) = .42, *p* < .001). The combined AOD ladder had a mean score of 5.0 (SD = 1.79), skewness = −.61 (SE = .12), and kurtosis = −.56 (SE = .25), indicating a normal distribution.

Table 2 also contains information on zero-order correlations between the ladder scores and theoretically related variables used to provide evidence of convergent and concurrent validity in later analyses with covariates (Kazdin, 1992). Of note are the intercorrelations among the four motivation-to-quit items: desire to quit, perceived difficulty of quitting, expectations of success at quitting, and importance of treatment. The small-to-moderate magnitudes of these correlations (*Pearson's r* range = .11 to .37) show that these items are non-redundant despite being susceptible to common source variance, common method variance, and social desirability biases that inflate correlations between related variables.

Discriminant Validity

Thirteen baseline demographic and health characteristics (all those listed in *Measures: Baseline Characteristics* except number of prior treatment episodes and current treatment status) were examined for their strength of association with the combined AOD ladder using regression analyses. These variables were entered simultaneously into a regression equation predicting the combined ladder score. Analyses showed only four variables significant at the $p < .10$ level (this criterion was selected to liberally identify potential covariates for inclusion in subsequent validity analyses, thus providing more a rigorous test of ladder construct validity). Higher ladder scores were associated with more legal involvement, lesser employment history, older age, and ethnicity other than African American. In the analyses for convergent and concurrent validity that follow, these four variables were entered as a group in the first step of the regression equations to control for their effects on the combined ladder score.

Convergent and Concurrent Validity

Convergent validity of the combined ladder was examined for four conceptually related treatment motivation variables. Four separate hierarchical regressions were conducted to predict the ladder score. In step 1, four covariates (age, ethnicity, legal involvement, job history) were entered; in step 2, the given treatment motivation variable was entered. Note that β is the standardized partial regression coefficient for the given predictor; sr^2 is the squared semipartial correlation, which represents the unique contribution of the given predictor to the total variance in the dependent variable accounted for by the set of predictors (Tabachnick & Fidell, 1989). All motivation variables were significant in the expected direction, with higher motivation scores predicting higher ladder scores: desire to quit using alcohol/drugs (N = 320; β = .57, $p < .001$, $sr^2 = .31$), expectation of success at quitting (N = 295; β = .26, $p < .001$, $sr^2 = .07$), perceived difficulty of quitting (N = 295; β = .12, $p < .05$, $sr^2 = .01$), and importance of obtaining treatment for alcohol/drugs (N = 374; β = .12, $p < .05$, $sr^2 = .01$).

Concurrent validity was examined for three AOD-related baseline variables expected to be associated with readiness to abstain. Three hierarchical regressions were conducted as described above. All variables predicted the combined ladder in the expected direction: number of prior AOD treatment episodes (β = .10, $p < .10$, $sr^2 = .01$), being in drug-free treatment at baseline (β = .17, $p < .01$, $sr^2 = .03$), and PDA in the prior month (β = .26, $p < .001$, $sr^2 = .07$).

Predictive Validity: Main Findings

Predictive validity of the combined ladder was examined with a series of Generalized Estimating Equation (GEE) models, an extension of the General Linear Model that permits a within-subject repeated measures examination of change over time as well as correction of variance estimates for longitudinal correlated data within subject (Zeger & Liang, 1986; Zeger, Liang, & Albert, 1988). GEE models tested whether baseline ladder score predicted substance use outcomes (number of problem days due to AOD use, PDA) and participation in AOD services (days in drug-free treatment, receipt of AOD services) over one year. To account for factors that may confound an association between the ladder score and long-term substance use, several covariates were tested as predictors of the substance use variables prior to adding

the ladder score: gender, age, ethnicity, housing, education, legal involvement, psychiatric treatment utilization, program assignment, baseline abstinence, prior treatment episodes, and employment history. The following covariates had a marginal association ($p < .10$) with a substance use variable and were retained in the final GEE model for that variable: prior AOD treatment episodes, for number of days in drug-free treatment; ethnicity and prior treatment episodes, for receipt of AOD services; gender, legal involvement, baseline abstinence, and prior treatment episodes, for problem days due to AOD use; and legal involvement and baseline abstinence, for PDA. Effect sizes were calculated for significant results using Cohen's d statistic; according to Cohen (1988), $d = .20$ is a small effect, .50 is medium, and .80 or greater is large.

A significant main effect of the combined ladder was found for PDA only, with higher ladder scores predicting greater abstinence over the 12-month follow-up period (B(SE) = 3.86 (.86), $p < .001$, $d = 2.13$). This indicates that a 1-point increase in ladder score was associated with a 3.86 unit difference in PDA combined across all 12 months. We also analyzed time by ladder interactions were found for PDA ($p < .10$), number of days in treatment ($p < .10$), and receipt of AOD services ($p < .01$). The more liberal criterion value $p < .10$ was used to prevent Type II error, given that testing for interactions using centered product terms is a highly conservative approach. To diagnose these interactions, hierarchical regression models (retaining identified covariates) were used to test ladder score as a predictor of outcome at each of the four timepoints separately: 1, 3, 6, and 12-month follow-up. For PDA, which was assessed monthly, the twelve timepoints were collapsed into four quarters for analyses of interaction effects: months 1–3, 4–6, 7–9, and 10–12. Higher ladder scores predicted greater receipt of AOD services (OR = 1.26; 95% CI = 1.08, 1.48; $p < .01$; $d = .13$) and more days in drug-free treatment (B(SE) = .49 (.29), $p = .10$, $d = .19$) at 1 month only. Higher scores predicted greater PDA at each timepoint, with the strength of association decreasing somewhat after the first quarter: months 1–3: B(SE) = 4.44 (.83), $p < .001$, $d = 2.46$; months 4–6: B(SE) = 3.08 (1.03), $p < .01$, $d = 1.70$; months 7–9: B(SE) = 3.73 (1.16), $p < .01$, $d = 2.06$; months 10–12: B(SE) = 3.40 (1.17), $p < .01$, $d = 1.88$.

Predictive Validity: Exploratory Analyses

Three sets of exploratory analyses were conducted to articulate the main predictive validity analyses. First, predictive validity analyses were re-conducted separately for the alcohol ladder (n = 296) and drug ladder (n = 335) to check for substance-specific properties of the ladder method. Results mirrored those found for the combined AOD ladder score. Main effects of both the alcohol ladder (B(SE) = 2.71 (.86), $p < .01$, $d = 1.50$) and drug ladder (B(SE) = 3.48 (1.05), $p < .01$, $d = 1.92$) were found for PDA, with higher ladder scores predicting greater percent days abstinence over time. Ladder by time interactions were also found for both the alcohol ladder ($p = .08$) and drug ladder ($p = .003$). Interactions were probed using the methods described above for the combined ladder score. As with the combined score, higher scores on both individual ladders predicted greater PDA at each timepoint, with the strength of association decreasing somewhat after the first quarter.

Second, we examined the incremental value of the combined AOD ladder over the 1-item question about motivation to quit using substances, "*How strong is your desire to quit drinking/ drug use at this time?*" The desire-to-quit item was entered as a covariate in the GEE model described above, prior to entering the combined AOD ladder. The desire-to-quit item was not a significant predictor of PDA, whereas the combined ladder score remained significant (B (SE) = 2.52 (1.19), $p < .05$, $d = 1.39$), supporting its validity over the single motivation item.

Third, all predictive validity analyses were re-conducted for three subsamples: those in drug-free AOD treatment at baseline (n = 114), those in methadone treatment at baseline (n = 102), and those not enrolled in treatment (n = 177). A main effect of ladder predicting PDA was

found for those in drug-free treatment (B(SE) = 4.15 (1.38), $p < .01$, $d = 2.29$), and for those in no treatment (B(SE) = 3.02 (1.43), $p < .05$, $d = 1.67$). No main effect for PDA was found for the methadone subsample, and no effects were found for any other outcome. The time by ladder interactions found for the full sample were not significant in any of the three treatment subsamples, which may be due to reduced power that resulted from splitting the sample.

Discussion

The current study found that a combined contemplation ladder for alcohol and drug use had adequate psychometric properties for predictive validity and adequate properties within a sample of substance-using male and female welfare recipients who were enrolled in or referred to AOD treatment services: normal distribution, discriminant validity with demographic and non-AOD characteristics, convergent validity with conceptually related treatment motivation variables, and concurrent validity with AOD treatment and substance use variables. Most important for clinical purposes, the combined ladder showed predictive validity for participation in AOD services up to one month later (small effect sizes) and abstinence outcomes up to one year later (large effect sizes). In exploratory analyses, the individual alcohol ladder and drug ladder each showed predictive validity that mirrored findings for the combined ladder. Also, the combined AOD ladder demonstrated incremental value over a one-item motivation question, and it had predictive validity for those in drug-free treatment and no treatment at baseline but not for those in methadone maintenance.

These findings are among the very first to confirm the validity of the ladder method for assessing readiness to abstain from illicit substances. LaBrie et al. (2005) found that an alcohol ladder was related to concurrent behavioral intentions to reduce drinking, whereas Bluthenthal et al. (2001) found that a ladder presenting readiness to change drug use was inversely related to previous participation in alcohol treatment and unrelated to recent participation in a needle exchange program. Study results are similar to those reported for adolescents by Slavet et al. (2006) and King et al. (2009), who found that readiness-to-change items predicted later marijuana use in teens even after controlling for baseline levels of drug use. The current study is to our knowledge the first to examine the long-term predictive validity of the ladder method in an adult substance-using population.

Predictive validity effects were found for those not in treatment at baseline and for those in drug-free outpatient treatment, but not for those in methadone maintenance. These results parallel findings previously reported in this sample for one-year AOD outcomes (Morgenstern et al., 2009) and employment outcomes (Morgenstern et al., in press), wherein no treatment effects were shown for the methadone maintenance subgroup. Based on this pattern, it appears that treatment readiness assessment methods and intervention strategies for methadone populations may require greater tailoring to the specific features of methadone clients and programs. For example, clients who continue to relapse are typically discharged from drug-free treatment but continue to receive treatment in methadone programs. These differences create different contingencies for abstaining that may affect treatment readiness, participation, and long-term benefits. To our knowledge, no other studies exist on readiness to abstain among methadone clients.

Study findings indicate that the AOD contemplation ladder can be an effective tool for predicting short-term participation in treatment services and long-term treatment outcomes for adult substance users. Because contemplation ladders are easy to administer and interpret, they have great potential utility as cost-effective assessment tools within drug treatment service systems and also within other public health sectors characterized by pervasive substance use problems such as mental health, welfare, child welfare, criminal and juvenile justice, and homelessness systems of care. They may also be useful in drug treatment settings for

determining which newly enrolled clients would benefit from motivational enhancement interventions at the very outset of services (LaBrie et al., 2005).

A primary study limitation is the absence of repeated ladder measurements over time, without which test-retest reliability and sensitivity to change analyses cannot be conducted. It is essential to establish the reliability of the AOD contemplation ladder by assessing other samples at multiple points prior to starting treatment or enrolling in case management services intended to influence readiness to abstain. The ladder will have added value if it proves capable of reflecting change in readiness to abstain over time as a function of treatment participation and/or progress. It is also important to test its validity for young adult samples and/or samples with less severe substance use problems. A second set of limitations pertains to study generalizability. The study sample was drawn from an inner-city population of welfare applicants whose demographic characteristics—primarily ethnic minority, economically disadvantaged, and about half involved in the criminal justice system—may not represent the populations of other AOD treatment contexts. In addition, the selection criteria for the randomized trial—no acute psychiatric problems, not homeless, not intending to leave the area for six months—were designed to increase internal validity (suitability of the experimental condition, CCM) but thereby decreased external validity by excluding persons with severe mental illness and transience who are commonly found among substance-using welfare populations.

Acknowledgments

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Table 1

Distribution of scores across rungs of the Alcohol, Drug, and Combined AOD Ladders

	Alcohol (N = 296)	Drug (N = 335)	Combined (N = 394
	N (%)	N (%)	N (%)
(1) I do not have a problem with drinking/drugs, and I do not intend to cut down	54 (18%)	12 (4%)	26 (7%)
(2) I might have a problem with drinking/drugs, but I do not intend to cut down or quit now	9 (3%)	5 (2%)	8 (2%)
(3) I am thinking about cutting down on my drinking/drug use, but I am not thinking about quitting drinking/drug use altogether	41 (14%)	20 (6%)	49 (13%)
(4) I am thinking about quitting drinking/using drugs altogether, but I still have not made any definite plans	45 (15%)	60 (18%)	73 (19%)
(5) I am close to making a decision to quit drinking alcohol/using drugs	35 (12%)	54 (16%)	52 (13%)
(6) I have decided to quit drinking alcohol/using drugs, at least for now	54 (18%)	67 (20%)	62 (21%)
(7) I have decided to quit drinking alcohol/using drugs and plan never to drink/use drugs again	57 (19%)	117 (35%)	104 (26%)

Table 2

Bivariate Correlations (Pearson's r) among Baseline Values of Substance Use Variables (Study Sample N = 394[a])

	1	2	3	4	5	6	7	8	9
1. Alcohol Ladder	--	--	--	--	--	--	--	--	--
2. Drug Ladder	.42** (237)	--	--	--	--	--	--	--	--
3. Combined Alcohol/Drug Ladder	.74** (296)	.69** (335)	--	--	--	--	--	--	--
4. Desire to Quit Using Alcohol/Drugs	.35** (255)	.56** (282)	.58** (335)	--	--	--	--	--	--
5. Perceived Difficulty of Quitting Alcohol/Drugs	.06 (233)	-.03 (266)	.15* (310)	.18* (310)	--	--	--	--	--
6. Expectation of Success at Quitting Alcohol/Drugs	.15 (234)	.30** (265)	.25** (310)	.37** (310)	-.13 (309)	--	--	--	--
7. Importance of Obtaining Alcohol/Drug Treatment	.15* (294)	.06 (332)	.14* (390)	.31** (333)	-.11 (308)	.30** (308)	--	--	--
8. Treatment Status at Baseline	.23** (293)	.15* (332)	.16* (390)	.00 (331)	.05 (307)	-.08 (307)	-1.01 (386)	--	--
9. Percent Days Abstinent (PDA) in Month Prior to Baseline	.19* (244)	.21** (269)	.25** (319)	.10 (280)	.18* (261)	.02 (262)	-.15* (315)	.30* (315)	--
10. Prior AOD Treatment Episodes	.07 (362)	.06 (361)	.12* (362)	.12* (310)	.15* (289)	.00 (288)	.17** (358)	.03 (358)	-.13* (302)

*
$p < .05$,

**
$p < .01$

[a]Because substance use variables were not applicable or missing for some participants, the N for each correlation is contained in parentheses in each cell.