



Published in final edited form as:

Psychol Addict Behav. 2008 September ; 22(3): 362–371. doi:10.1037/0893-164X.22.3.362.

Convergent and Discriminant Validity of Three Measures of Stage of Change

Lucy E. Napper

Center for Behavioral Research and Services, California State University, Long Beach

Michele M. Wood and Adi Jaffe

University of California, Los Angeles

Dennis G. Fisher and Grace L. Reynolds

Center for Behavioral Research and Services, California State University, Long Beach

Jennifer A. Klahn

University of California, Los Angeles

Abstract

The University of Rhode Island Change Assessment (URICA; McConaughy, Prochaska & Velicer, 1983), the Stage of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996), and the Readiness to Change Questionnaire (RCQ; Rollnick, Heather, Gold & Hall, 1992) are commonly used multi-dimensional measures of stage of change. The present study examined the convergent and discriminant validity of drug-use versions of these three measures through multi-trait multi-method analysis (MTMM) in a population of indigent out-of-treatment drug users ($N = 377$). Agreement in stage-of-change assignment and the relationship between stage of change and drug-use behaviors also were examined. Confirmatory Factor Analysis (CFA) suggests that the SOCRATES may have questionable convergent validity with the URICA and RCQ. There was moderate agreement in stage assignment. The analysis of behavior did provide some support for the construct validity of the measures. The results suggest that these drug-use stage-of-change measures may not be equivalent.

Keywords

Readiness to change; Stages of change; Substance use; Drug abuse

The Transtheoretical Model (TTM) of Behavior Change (Prochaska & DiClemente, 1986,1992) has provided an increasingly popular model for understanding how people intentionally modify addictive behaviors. This model suggests that, as an individual changes a given behavior, he or she progresses through discrete stages (Prochaska, DiClemente, &

Address correspondence to: Dennis G. Fisher, PhD, Director, Center for Behavioral Research and Services, California State University, Long Beach, 1090 Atlantic Avenue, Long Beach, CA 90813 USA (Fax: 562.983.1421, Phone: 562.495.2330, dfisher@csulb.edu).

Lucy E. Napper, Dennis G. Fisher and Grace L. Reynolds, Center for Behavioral Research and Services, California State University, Long Beach.

Michele M. Wood, Adi Jaffe and Jennifer A. Klahn, University of California, Los Angeles.

Publisher's Disclaimer: The following manuscript is the final accepted manuscript. It has not been subjected to the final copyediting, fact-checking, and proofreading required for formal publication. It is not the definitive, publisher-authenticated version. The American Psychological Association and its Council of Editors disclaim any responsibility or liabilities for errors or omissions of this manuscript version, any version derived from this manuscript by NIH, or other third parties. The published version is available at <http://www.apa.org/journals/adb>.

Norcross, 1992). TTM has been adapted several times (Sutton, 2001), with the most popular version identifying five stages: precontemplation, contemplation, preparation, action, and maintenance. In the precontemplation stage, an individual may be unaware that he or she has a problem with, as an example, drug use, and does not intend to change the behavior (Prochaska et al., 1992). As a person recognizes the need to change, he or she moves into the contemplation stage. At this point, a person will consider the advantages and disadvantages of changing the behavior. Those who then make a decision to change progress to the preparation stage, also known as the determination stage. An individual in this stage intends to take immediate action to change the behavior, and typically already has begun to engage in activities to support this change (Velicer, Prochaska, Fava, Norman, & Redding, 1998). During the action stage, a person will take specific steps to modify the behavior. If this initial behavior change is successful, then a person progresses to the maintenance stage where the behavior change is integrated into his or her lifestyle, and the individual attempts to prevent relapse (Bellack & DiClemente, 1999).

As well as providing a framework for understanding how people change addictive behaviors, TTM can inform the development of effective treatments for substance abuse. Prochaska et al. (1992) suggest that matching an individual's substance abuse treatment to his or her stage of change can increase the efficacy of therapy.

If matching a treatment plan to an individual's stage of change is important for effective treatment, then accurate assessment of an individual's stage of change is also key. Within the substance abuse literature, there are a variety of instruments used to assess stages of change, including multi-dimensional measures such as the University of Rhode Island Change Assessment (URICA; McConaughy, Prochaska, & Velicer, 1983), the Stage of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996), and the Readiness to Change Questionnaire (RCQ; Rollnick, Heather, Gold, & Hall, 1992). Data examining the reliability and validity of these different approaches has produced mixed findings.

The URICA assesses four stages of change: precontemplation, contemplation, action and maintenance. Unlike the RCQ and SOCRATES, which focus on substance use, the URICA is not specific to drug use, but refers generically to a client's "problem" behavior. Each of the four subscales has been shown to have acceptable internal and test-retest reliability (Abellanas & McLellan, 1993; McConaughy et al., 1983). There have been, however, mixed findings supporting the validity of the URICA (Carey, Purnine, Maisto, & Carey, 1999). Factor analysis has supported the four-factor structure in some studies (Carney & Kivlahan, 1995), but not in others (Belding, Iguchi, & Lamb, 1996). Cluster analysis has identified different numbers of stage profiles (Blanchard, Morgenstern, Morgan, Labouvie, & Bux, 2003; McConaughy et al., 1983; Willoughby & Edens, 1996), and evidence for the predictive validity of the URICA is inconsistent (Blanchard et al., 2003; Henderson, Saules, & Galen, 2004; Pantaloni & Swanson, 2003).

The SOCRATES was developed to parallel the URICA, providing a measure of stage of change specifically for alcohol problems (Miller & Tonigan, 1996). The instrument has subsequently been adapted to assess stage of change for drug use and sexual practices (Isenhardt, 1994; Rainoff, Rodríguez, Fisher, & Muñoz, 2002). Unlike the URICA and RCQ, where higher scores on the precontemplation stage indicate that individuals are unaware of a problem, those endorsing items on the SOCRATES precontemplation stage are acknowledging that they have a problem with drugs. Factor analysis of the instrument has revealed three orthogonal factors on the SOCRATES: Taking Steps, Recognition, and Ambivalence. The taking-steps subscale includes items that were originally action and maintenance items. Recognition resembles the precontemplation and preparation stages;

however, unlike the URICA and RCQ, it is scored such that those who score highly on recognition, do perceive themselves to have a problem. The ambivalence subscale reflects the contemplation stage.

Early versions of the SOCRATES, using the original precontemplation, contemplation, determination and action stages, demonstrated good internal reliability (Miller & Tonigan, 1996). The three-factor structure of the SOCRATES has been supported (Mitchell, Francis, & Tafrate, 2005), although some studies have identified two factors: taking steps and AMREC, a combination of ambivalence and recognition (Figlie, Dunn, & Laranjeira, 2005; Maisto et al., 1999). Studies examining the relationship between scores on the alcohol version of the SOCRATES and the alcohol-related problems and behaviors of respondents have provided some evidence supporting the construct and predictive validity of the measure (Carey et al., 1999).

Like the SOCRATES, the RCQ was adapted from the URICA to provide a measure of stage of change specific to alcohol abuse. The RCQ has subsequently been adapted for drug use (Addington, el-Guebaly, Duchak, & Hodgins, 1999) and assesses three stages of change: precontemplation, contemplation and action. The internal reliability of the subscales has been supported (Rollnick et al., 1992), although not always in treatment-seeking populations (Gavin, Sobell, & Sobell, 1998). Reanalysis of the original RCQ data in Rollnick et al. (1992) has suggested that a single continuous variable of readiness to change could provide a better fit to the data than the original three factors (Budd & Rollnick, 1996). Both the concurrent and predictive validity of the measure have received support (Heather, Rollnick, & Bell, 1993; Heather, Rollnick, Bell, & Richmond, 1996; Rollnick et al., 1992).

At present, there is no gold standard in measuring stage of change in the drug abuse literature, and there is a lack of research comparing different measurement approaches. Few studies have attempted to compare the RCQ, URICA or the SOCRATES with algorithm measures of stage of change (Belding et al., 1996; Carey, Purnine, Maisto, & Carey, 2002; Etter & Perneger, 1999; Etter & Sutton, 2002; Farkas et al., 1996) or directly with each other (Addington et al., 1999; de Oliveira Júnior & Malbergier, 2003; Hodgins, 2001; Nochajski & Stasiewicz, 2005).

Nochajski and Stasiewicz (2005) compared the URICA to an alcohol version of SOCRATES and found moderate agreement between stage assignment on the two measures, with roughly one-third (32%) of participants assigned to equivalent stages. Hodgins (2001) compared alcohol versions of the RCQ and SOCRATES in an alcohol-dependent population. Instead of using Miller and Tonigan's (1996) three-factor structure of the SOCRATES, for a more equivalent analysis, Hodgins used the original five stages (precontemplation, contemplation, determination, action, and maintenance; Prochaska & DiClemente, 1986). Examination of the convergent validity of the two measures revealed that the precontemplation ($r = .79$) and action stages ($r = .82$) showed good convergent validity, while the contemplation stages were moderately correlated ($r = .43$). A further study by Addington et al. (1999) compared drug-use versions of the SOCRATES and RCQ in a small sample of people with schizophrenia ($N = 39$). Using Miller and Tonigan's three-factor structure, they found 57% agreement in stage assignment between the RCQ and SOCRATES.

To the authors' knowledge, there is currently no research directly comparing the URICA with drug-use versions of both the RCQ and SOCRATES. Although all three scales have proven to be popular instruments within the field of substance abuse, there is currently a lack of research comparing these different approaches and their psychometric properties (Carey et al., 1999; Mitchell et al., 2005).

The current study aims to extend previous research by using multi-trait multi-method (MTMM; Campbell & Fiske, 1959) analysis to examine the convergent and discriminant validity of the URICA, RCQ and SOCRATES. MTMM provides a method of assessing the construct validity of the different approaches, that is, whether these different measures assess the same underlying constructs. The present study uses Confirmatory Factor Analysis (CFA) to analyze the MTMM matrix. Agreement in stage assignment among the three measures also is examined. Concurrent validity of the measures is assessed by examining the relationship between stage of change and relevant drug-use behaviors. Using these different approaches, the current study aims to examine the relationship between these measures of stage of change and their individual psychometric properties.

Method

Participants

From a group of 793 out-of-treatment drug users accessing a Counseling and Food Program that provides HIV prevention counseling and a food bank program to indigent active drug users, 605 participants (461 men) were recruited into the present study. Participants who completed at least two of the three stage of change measures were included in the final analysis ($N = 377$; 288 men). All the participants in the sample completed the SOCRATES, 293 completed the URICA (77.7%), and 239 (63.4%) participants completed the RCQ. In total, 155 of the participants completed all three of the measures. Variation in the number of participants completing the different instruments was due to factors such as clients declining to complete some instruments and the RCQ being removed from the questionnaire packet to reduce participant burden. In total, 287 of the participants were asked to complete the RCQ before it was removed from the questionnaire packet¹. Missing data on the URICA was due, in part, to clients being able to choose either to answer questions relating to the same drug as they did for the RCQ and the SOCRATES, or to select a problem related to their sex behaviors. URICA data were not included where participants choose a sex problem ($n = 75$) rather than the problem related to the same drug assessed via the other measures².

The participants ranged in age from 18 to 68 years old ($M = 43.3$, $SD = 9.31$). The majority of participants were African American (62.3%), 24.1% were White, 9.6% were Hispanic/Latino, 2.9% were Native American, and 1.1% were Asian. Over half the sample reported that they were currently homeless (57.9%) and about a third of the participants (35.9%) indicated that they had not finished high school. Of the participants, 91.5% reported having ever used crack, 91.5% having ever used amphetamines, and 27.2% having injected drugs in the last 30 days.

Measures

URICA—Participants ($n = 293$) were required to select a problem behavior to think about while completing the URICA (McConaughy et al., 1983). Participants selected a problem related to their current drug use from the following list: not bleaching needles (3.7%), sharing needles (3.7%), sharing rinse water (0.7%), sharing cookers and cottons (0.7%), injecting drugs (6.6%), using crack (41.2%), using speed (5.6%), using drugs too much (30.2%), or “my drug use” (7.4%). Participants were instructed to “indicate the extent to which you tend to agree or disagree with each statement” and were presented with 32 items assessing four stages of change: precontemplation, contemplation, action and maintenance.

¹Participants who did not complete the RCQ did not significantly differ from those who did in terms of either their drug use ($t(344) = -1.28$, $p = .20$) or their stage of change as assessed by the SOCRATES ($Z = -.64$, $p = .52$).

²Those participants with missing data on the URICA did not significantly differ from those without missing data in terms of their drug use ($t(344) = -.69$, $p = .49$) or their stage of change on the SOCRATES ($Z = -.03$, $p = .98$).

Assessment for each of the stages included the following items, “As far as I am concerned, I don’t have any problems that need changing” (precontemplation), “I have a problem and I really think I should work on it” (contemplation), “Anyone can talk about change, I am actually doing something about it” (action), and “I’m here to prevent myself having a relapse of my problem” (maintenance). Responses were given on a 5-point Likert scale ranging from *Strongly disagree* (1), *Disagree* (2), *Undecided or Unsure* (3), *Agree* (4), to *Strongly agree* (5). For analysis where participants were assigned to a stage of change, participants’ scores on each of the URICA subscales were standardized, and these standardized scores were used to assign participants to the stage on which they scored highest. Where there were ties, participants were assigned to the stage furthest along the continuum.

RCQ—The RCQ (Rollnick et al., 1992) forms a 12-item scale that assesses precontemplation, contemplation and action. Participants ($n = 239$) completed a drug-use version of the RCQ, in which items were adapted from the original alcohol version to refer to using drugs. Examples of items used to assess each stage include, “I don’t think I use drugs too much” (precontemplation), “Sometimes I think I should cut down on my drug use” (contemplation), and “I am actually changing my drug using habits right now” (action). Participants responded on a 5-point Likert scale ranging from *Strongly disagree* (1) to *Strongly agree* (5). To assign individuals to a stage of change, scores on each of the subscales were standardized and participants were assigned to the stage on which they scored most highly. Where participants scored equally on two or more subscales they were assigned to the stages furthest along the continuum.

SOCRATES—Participants ($n = 377$) completed the SOCRATES-8D. Following Hodgins (2001), the original five factors (precontemplation, contemplation, determination, action, and maintenance) were assessed in order to compare the same constructs across the other measures. The SOCRATES consists of three items assessing precontemplation (e.g. “I have a serious drug problem”), four items measuring contemplation (e.g. “Sometimes I wonder if I am an addict”), four items assessing determination (e.g. “I have a drug problem”), four items assessing action (e.g. “I am working hard to change my drug use”), and four items assessing maintenance (e.g. “I was using drugs too much at one time, but I’ve managed to change that”). Responses are given on a 5-point Likert scale ranging from *Strongly disagree* (−2) to *Strongly agree* (+2). For ease of interpretation, the SOCRATES precontemplation scale was reverse coded, such that, consistent with the equivalent scales in the RCQ and URICA, high scores on the precontemplation subscale indicted participants did not recognize that they had a drug problem. Standardized scores were used to assign participants to the stage on which they scored highest. Where participants scored identically on two or more stages, they were assigned to the stage furthest along the continuum (Hodgins, 2001).

Risk Behavior Assessment—The Risk Behavior Assessment questionnaire (RBA; National Institute on Drug Abuse, 1993) assesses drug and sexual risk behaviors, drug treatment history, medical history and other demographic variables. Drug use was assessed using the following items: “How many days have you used (crack/cocaine/marijuana/heroin/ other opiates/amphetamines) in the last 30 days?” and “Please tell me which drugs you have used in the last 48 hours/two days?” (crack/cocaine/marijuana/heroin/other opiates/ amphetamines). Participants were also asked, “How many times (number of injections) did you inject drugs in the last 30 days?” Participants completed further items measuring drug treatment history, “Have you ever in your lifetime been in a drug treatment or detox program?” and “Altogether, how many weeks during your lifetime have you been in (methadone detoxification/ methadone maintenance/outpatient drug free/residential treatment/ prison or jail treatment/ other drug treatment or detox program)? The drug-use

and drug-treatment questions have been found to have good reliability and validity (Dowling-Guyer et al., 1994; Edwards, Fisher, Johnson, Reynolds, & Redpath, 2007; Fisher et al., 1993; Needle et al., 1995; Weatherby et al., 1994) and were used to assess the construct validity of the stage of change measures. Based on the TTM, we would expect that those in the action and maintenance stages would be more likely to have taken steps to change their drug-use behaviors, for example, by using fewer drugs, injecting drugs a fewer number of times, or having attended a drug treatment program, in comparison to those who did not intend to change (precontemplators) or have not yet made a decision to change (contemplators).

Procedure

Participants were recruited as walk-ins and through street outreach by the Counseling and Food bank program staff. Counselors met with participants individually in a private area to ensure confidentiality, and reviewed the informed consent form before conducting the interview. During the interview, participants completed the Risk Behavior Assessment, followed by the stage-of-change measures. Participants were instructed to consider the same drug while completing all three stage-of-change measures.

Confirmatory Factor Analysis

A confirmatory factor analysis (CFA) was conducted in order to assess the convergent, as well as discriminant, validity of the three scales in measuring stages of change. In the context of this study, “method” refers to each of the measures (i.e. URICA, RCQ and SOCRATES), while “trait” refers to each of the constructs measured by the subscales (e.g. precontemplation, contemplation, action, maintenance). As an approach to analyzing the MMTM matrix, CFA allows for the exploration of shared variance due to both common method and common trait, while having the advantage of providing fit statistics (Cole, 1987; Marsh & Hocevar, 1988). These fit statistics allow for a more-objective assessment of the data and hence more-informed conclusions.

The CFA model was assessed using the EQS structural equation program (Bentler, 2006). Goodness-of-fit of the models was assessed with the maximum-likelihood χ^2 statistic, the Comparative Fit Index (CFI), and the root mean squared error of approximation (RMSEA) (Bentler, 2006; Bentler & Dudgeon, 1996; Hu & Bentler, 1999). The CFI ranges from 0 to 1 and reflects the improvement in fit of a hypothesized model over a model of complete independence among the measured variables (Bentler, 2006). Values approaching .95 or greater are desirable for the CFI. The RMSEA is a measure of fit per degrees of freedom, controlling for sample size; values less than .06 indicate a relatively good fit (Hu & Bentler, 1999). Suggestions for model modifications to improve the fit were obtained from the LaGrange Multiplier (LM) test (Bentler, 2006). Missing data were handled with the Maximum Likelihood (ML) missing data procedures available in the EQS structural modeling program (Bentler, 2006). Using ML, rather than listwise deletion, allows for maximal use of available data, even from participants for whom one of the stage-of-change measures is missing. EM imputation was utilized in which parameter estimates were obtained by cycling iteratively between an expectation (E) step and a maximization (M) step (Bentler, 2006).

Results

Reliability

The internal reliability of the subscales of the URICA, SOCRATES and RCQ were examined. All four stages of the URICA and the action stage of the RCQ demonstrated good internal reliability (Table 1). The RCQ precontemplation and contemplation stages, and the

SOCRATES action stage had moderate internal reliability. The SOCRATES precontemplation, contemplation, determination and maintenance stages demonstrated questionable to poor internal reliability.

Confirmatory Factor Analysis

The initial model used three method factors (i.e., one per scale used) and four trait factors (i.e., one for each stage of change with more than a single indicator). Mean non-standardized scores for each of the subscales on each of the instruments were set to load appropriately on both their specific method and on the trait they were purported to measure. The SOCRATES determination stage could not be assessed using a latent factor due to it having only a single indicator. All methods' latent factors were allowed to covary, as were all trait factors, though covariance between method and trait factors was fixed at zero. In addition, the error associated with the SOCRATES determination variable was allowed to covary with the trait factors as it was the sole indicator of this stage of change. This resulted in inadequate model fit ($\chi^2(30, N = 373) = 176.38$, CFI = .956, RMSEA = .068), though many of the loading coefficients within the model were significant. Given the relatively low correlation between the SOCRATES indicator of precontemplation and indicators of that stage from the RCQ ($r = .32$) and URICA ($r = .12$), the loading of this variable on factor one (i.e., the precontemplation factor) was removed. This change greatly improved factor 1 loadings, though overall fit was still inadequate ($\chi^2(30, N = 373) = 138.43$, CFI = .944, RMSEA = .077) and the SOCRATES factor loading for the precontemplation variable became inappropriately constrained at its lower bound of -1.00 . For this reason, the variable itself was removed from the model. This change, along with the freeing of a residual correlation suggested by the LM test to be significant, as well as the trimming of all non-significant paths, resulted in the final model (Figure 1). This model provided much better model fit ($\chi^2(26, N = 373) = 42.31$, CFI = .999, RMSEA = .010), as well as stronger factor loadings for the variables remaining in the model.

Discriminant validity

Evidence for discriminant validity is indicated by the correlations among the four trait factors (the four stages). Non-significant correlations indicate that the traits/stages are distinct from one another (Cole, 1987). The contemplation trait was found to be negatively correlated with the precontemplation trait ($r = -.44$, $p < .05$). However, as this correlation is relatively small, it is unlikely to indicate questionable discriminant validity. All other correlations between the trait factors were non-significant, indicating discriminant validity for the other traits.

Convergent validity

Convergent validity is indicated by significant factor loadings of each of the measures on the appropriate trait or stage (Cole, 1987). The final model demonstrated convergent validity for the URICA and RCQ's precontemplation stages and all three measures' action stages. All three measures significantly loaded onto the contemplation trait; however, the SOCRATES contemplation subscale loaded negatively, in the opposite direction to the other contemplation subscales ($r = -.240$, $p < .05$), suggesting questionable convergent validity. The final model failed to find evidence for the convergent validity of the URICA and SOCRATES' maintenance subscales, with neither measure significantly loading on this trait.

Comparison of stage assignment

Participants were assigned to a stage of change on the URICA, RCQ and SOCRATES. The precontemplation stage of the SOCRATES was reverse coded to be equivalent to the

precontemplation stage of the URICA and RCQ, such that high scores indicated that participants did not perceive themselves to have a problem with drugs. Overall, 45.7% of the participants were assigned to the same stage on the URICA as they were on the RCQ (Table 2). Comparison of the SOCRATES to the other two measures revealed 28.1% agreement in assignment with the URICA and 36.3% agreement with the RCQ.

As the RCQ assesses three stages of change, the URICA four stages, and the SOCRATES five stages, the Adjusted Rand Statistic was used to examine agreement in stage assignment (Fisher & Hoffman, 1988; Hubert & Arabie, 1985; the Adjusted Rand statistic assesses the correspondence of two measures, where 0 represents no correspondence and 1 complete correspondence). The URICA was found to have greater agreement with the RCQ (Adjusted Rand = .15, $n = 155$) than with the SOCRATES (Adjusted Rand = .03, $n = 293$). The RCQ and SOCRATES also showed weak agreement with each other (Adjusted Rand = .08, $n = 239$).

Stage of change and behavior

One-way ANOVAs, with stage of change as the independent variable, were conducted to examine whether stage of change, as assessed by the three measures, was associated with differences in the number of days participant used drugs in the past 30 days, the number of times participants had injected drugs in the past 30 days and the number of weeks that participants reported having previously spent in drug treatment (Table 3). Where significant differences by stage of change were found, Tukey's post-hoc tests were conducted. Participants' reports of the number of weeks they had spent in drug treatment and the number of times they had injected drugs in the past 30 days were log transformed to reduce the possible effects of extreme values. Raw data, however, are reported in text. Standardized stage-of-change scores were used to assign participants to a stage on each of the three measures. Cochran-Armitage tests for trends were conducted to examine whether participants' reports of having ever been in a drug treatment program (Yes/No), or having used drugs in the past 48 hours (Yes/No) varied by stage of change.

URICA—Participants' reports of the number times they had injected drugs in the past 30 days differed by stage of change, $F(3, 163) = 3.39, p < .05$. Post-hoc tests indicated that those in the contemplation stage ($M = 41.4$) had injected drugs more often than those who were in the action stage ($M = 11.3$). However, the effect size for differences between stages was small ($\eta = .06$). Reports of using drugs in the past 30 days, $F(3, 341) < 1, ns$, and the number of weeks individuals had spent in drug treatment, $F(3, 290) < 1, ns$, were not associated with participants' stage of change as assigned by the URICA. Cochran-Armitage tests for trends suggested that stage of change, as assessed by the URICA, was not associated with differences in participants' reports of ever being in drug treatment ($Z = -.11, p = .46$), or use of drugs in the past 48 hours ($Z = -.36, p = .72$).

RCQ—Participants' reports of injecting drugs differed by stage of change, as assessed by the RCQ, $F(2, 105) = 3.26, p < .05$. Those in the precontemplation stage ($M = 42.1$) injected drugs more often than those in the action stage ($M = 11.8$). Participants' reports of the number of weeks they had spent in treatment also differed by stage of change, $F(2, 237) = 3.54, p < .05$. Those in the precontemplation stage ($M = 26.7$) had spent fewer weeks in drug treatment than those in the contemplation stage ($M = 54.8$). Neither those in the precontemplation stage nor the contemplation stage significantly differed from those in the action stage. Number of days participants had used drugs over the last 30 days was found to differ by stage, $F(2, 218) = 8.35, p < .001$. Those in the action stage ($M = 12.6$) used drugs on fewer days than those in the contemplation ($M = 17.8$) and precontemplation stages ($M = 19.2$). The effect sizes for all significant analyses were small ($.03 < \eta < .08$).

Participants' reports of ever attending a drug treatment program did differ significantly by RCQ stage of change ($Z = -1.9, p < .05, n = 218$). Fewer participants in the precontemplation stage had been in drug treatment, compared to those in the action and contemplation stages. Participants' reports of having used drugs in the past 48 hours also varied by stage of change ($Z = 2.12, p < .05, n = 219$). As the stage of change progressed from precontemplation to action, fewer participants reported using drugs in the last 48 hours.

SOCRATES—There was a marginally significant difference in participants' reports of injecting drugs by stage of change, as assessed by the SOCRATES, $F(4, 166) = 2.02, p = .09$. Post-hoc tests did not reveal any significant differences between stages. Participants' reports of the number of weeks they had spent in treatment differed by stage of change, $F(4, 372) = 6.24, p < .001$. Those in the precontemplation stage ($M = 28.7$) had spent fewer weeks in drug treatment than those in the determination ($M = 62.8$) and action stages ($M = 35.2$). Those in the determination stage had also spent significantly longer in drug treatment than those in the contemplation ($M = 28.6$) and maintenance stages ($M = 35.5$). Use of drugs over the last 30 days differed by stage, $F(4, 348) = 5.32, p < .001$. Those in the action stage ($M = 11.7$) used drugs on a fewer number of days than those in the precontemplation ($M = 18.2$) and determination stages ($M = 19.3$). The effect sizes for differences in behavior by SOCRATES stage of change were all found to be small ($\eta = .06$).

Participants' reports of ever attending a drug treatment program ($Z = -1.0, ns, n = 348$) and use of crack in the past 48 hours ($Z = 1.07, ns, n = 326$) did not differ by SOCRATES stage of change. Participants' reports of having used drugs in the past 48 hours differed by stage of change ($Z = 32.22, p < .05, n = 349$). Precontemplators were more likely to report having used drugs than those at later stages of change.

Discussion

The present study aimed to extend the evaluation of drug-use stage-of-change measures by assessing the convergent and discriminant validity of the RCQ, URICA and SOCRATES. A multitrait-multimethod (MTMM) analysis using Confirmatory Factor Analysis (CFA) provided limited support for the convergent validity of the three measures. The SOCRATES appeared not to measure the same underlying constructs as the RCQ and URICA. Deletion of the SOCRATES' precontemplation stage improved model fit and the convergent validity of the other measures on the precontemplation trait. The final model suggested that the convergent validity of the SOCRATES' contemplation stage was also questionable. Furthermore, the maintenance stage of the URICA and SOCRATES lacked convergent validity. Only the action stage was found to have good convergent validity for all measures. There was evidence to support the discriminant validity of the measures. The three measures were found to demonstrate moderate agreement in stage assignment, ranging from 28.1% to 45.7% agreement. Stage of change, as assessed by the RCQ and SOCRATES, was found to be associated with the use of a range of drugs and drug treatment history. For example, those in the action stage reported using fewer drugs and spending more weeks in drug treatment compared to those in stages lower down the continuum. Using the URICA, only drug injection behavior was found to be associated with stage of change, with those in the action stage injecting less than those in the contemplation stage.

The questionable convergent validity of the SOCRATES with the URICA and RCQ suggests that the SOCRATES may be assessing related, but different, constructs than the RCQ and URICA. This finding contrasts that of Hodgins (2001), who found that an alcohol version of SOCRATES, when scored using the original five stages, generally demonstrated good convergent validity with the RCQ. As in the present study, however, Hodgins did find evidence that the contemplation stage of the SOCRATES was psychometrically weaker with

lower internal reliability and agreement with the RCQ. The questionable validity in the present study may be a result of using a drug versus an alcohol version of the instrument.

More generally, poor validity may reflect differences in the measurement of the stages between the SOCRATES and the equivalent subscales of the URICA and RCQ. Comparison of the three measures reveals a variety of subtle differences. These types of minor changes to stage-of-change questionnaires have been argued to potentially have a considerable impact upon measurement (Etter & Perneger, 1999). Unlike the items assessing the precontemplation stage using the URICA and RCQ, which are worded such that participants can deny having a problem, the SOCRATES has items that ask people whether they identify that they have a problem with drugs. These items were reverse coded, such that those who did not endorse items indicating that they have a problem with drugs received a high score on the precontemplation stage. This difference in the measurement of precontemplation could have impacted the convergent validity of the SOCRATES' subscale. Furthermore, unlike the URICA and RCQ, the SOCRATES is the only measure to use the term "drug addict" rather than asking whether participants identify themselves as having a problem with drugs. Other more subtle differences between the scales could also impact participants' responses. The present study demonstrates that even similar methods of measurement cannot be assumed to be equivalent, and may assess different underlying constructs.

The current study did provide some evidence for the discriminant validity of the measures. Although some of the factor covariances are moderately large, (e.g. between maintenance and action) the majority of the covariances were non-significant. Only the contemplation stage was found to be negatively related to precontemplation.

The moderate agreement between the three measures of stage of change is consistent with previous research comparing alcohol (Nochajski & Stasiewicz, 2005) and drug (Addington et al., 1999) versions of these measures. The RCQ and URICA were found to have the highest agreement in stage-of-change assignment. Nevertheless, over half the participants were assigned to different stages on the two measures. This discordance in stage assignment, as well as the mixed evidence for the convergent validity, is concerning from both clinical and research perspectives. Identifying a client's stage of change is considered important for tailoring effective interventions; however, if different measures result in different stage-of-change assignment, then there are clearly important implications for treatment and intervention evaluations. For example, if the stage-of-change measure used influences the type of therapy to which a client is matched, then not only does this potentially influence the effectiveness of treatment for an individual client, but it makes it difficult to compare studies that match clients to therapies based on different stage-of-change measures. The use of a variety of non-equivalent methods of assessing stage of change hinders the ability to accumulate evidence regarding the usefulness of stage of change as a construct (Sutton, 2001). Without a clear understanding of how stage-of-change measures differ, researchers and practitioners are not able to make informed decisions about whether a measure may be more appropriate to use in a specific setting.

From the results of the present study, it is not possible to make specific recommendations about which approach to measuring drug-use stage of change may be the most valid or appropriate. Strengths and limitations of each of the measures were evident. The URICA demonstrated excellent internal reliability for each of its subscales; however, the analysis of the behavioral data produced very limited support for the construct validity of the measure. Consistent with TTM, those in the action stage reported injecting drugs a fewer number of times than those who were thinking about changing (contemplators). However, those who reported taking steps to change their drug use behaviors (i.e. those in the action and maintenance stages) did not differ from those who did not (precontemplators and

contemplators) in terms of self-reported drug use and accessing drug treatment. Unlike the other two measures of stage of change, the URICA has the benefit of allowing participants to choose drug-related problems, other than just assigning “using drugs too much”. In some contexts, such as HIV harm-reduction interventions, where clients’ goals may not be to reduce drug use, but to reduce their HIV risk associated with drug-use behaviors, the URICA provides a useful tool for assessing stage of change. However, the general wording of the URICA may be a disadvantage in some contexts where clients may find it difficult to rephrase the items to be specific to their problem (Littell & Girvin, 2004). Furthermore, the complex sentence structures can be confusing, and precontemplators may find it challenging because they have to be able to identify a problem to complete the measure.

The RCQ also demonstrated acceptable internal reliability. The behavioral data suggested that a range of drug behaviors (including times injected drugs, use of drugs in the past 30 days and past 48 hours, and drug treatment history) differed by stage of change as assessed by the RCQ. Examination of the pattern of these stage differences revealed that, in the majority of cases, those in the precontemplation stage reported more drug use than those in the action and contemplation stage. Although this difference between precontemplators and those in the action stage is consistent with TTM, the present study found limited evidence that participants in the RCQ’s contemplation stage differed from those in the action stage, a finding that is contrary to the TTM. Furthermore, the effect sizes for all analyses examining differences in behavior were small, suggesting they may be of little-to-no importance.

The SOCRATES was found to have questionable reliability. The behavioral data revealed that stage of change, as measured by the SOCRATES, was associated with differences in drug-related behaviors. These differences were largely consistent with TTM, with those in the precontemplation stage reporting more drug use and spending less time in drug treatment than those at stages further along the continuum. However, as with the RCQ, some other differences that could be predicted by TTM, such as less drug use by those in the maintenance stage and more drug use by those in the contemplation stage, were not seen consistently, and effect sizes suggested the difference may have limited significance.

This study has several limitations. Only cross-sectional behavioral data were used to assess the construct validity of the three measures. From cross-sectional data it is not possible to say, for example, whether those in the action stage did actually reduce their drug use, or whether they used fewer drugs to begin with. The usefulness of these drug-use versions of stage-of-change measures can only fully be examined by the use of longitudinal data to investigate their predictive validity (Etter & Perneger, 1999; Sutton, 2001). Currently, there has been a lack of research specifically looking at drug-use versions of stage-of-change measures, and further research is needed to address this issue.

An additional limitation is that the general wording of the URICA may have made it possible for participants to consider slightly different drug-use behaviors when completing the three measures. For example, participants may have considered reducing their amphetamine use while completing the SOCRATES and the RCQ, but their needle sharing behavior when using amphetamines while completing the URICA. Participants were instructed to think about the same drug (for example, a problem with crack use) when completing all three measures; however, if participants considered a different drug-use behavior while completing the URICA, this may have reduced the convergent validity. Participants were given a limited list of drug-related problems to select from when completing the URICA, which could have limited the afore-mentioned potential problem. Furthermore, data examining the types of problems selected suggests that the majority of participants identified problems (such as use of crack or using drugs too much) that would be comparable on all three measures. However, due to the nature of the URICA, where

participants are asked to respond to generically worded items, it is possible that, despite our efforts, participants considered different aspects of their drug behavior. Participants' ability to choose specific drug-related problems on the URICA may also account for, in part, the limited behavioral evidence supporting the concurrent validity of the URICA. Some participants may have considered, for example, injection behaviors not directly assessed on the behavioral measures in the current study.

Further limitations of this study include the relatively small sample size for those completing the RCQ, and the inclusion of only out-of-treatment drug users in the current sample. The chosen population may be in stages lower down the continuum than, for example, individuals who are seeking treatment or in treatment, thus reducing the generalizability of the findings. Furthermore, the sample was not randomly selected, but consisted of an indigent population who were accessing a food bank program.

The present study did not include factor analyses to confirm the identified stages, but focused on testing established methods of scoring stage-of-change methods to inform those who may use these approaches as described in the literature. The current study assigned participants to stages using standardized scores for each of the subscales, and thus provides a measure of the stage agreement when this approach to stage assignment is utilized. The findings of this study may not generalize to studies which assign participants to stages based on other approaches, such as the use of raw scores, or use the three-factor structure of the SOCRATES.

The present study adds to a variety of studies highlighting potential problems with the measurement of stage of change. The findings suggest that different approaches to assessing stage of change do not necessarily assess the same underlying constructs and that the measure selected can impact to which stage of change a participant is assigned. Further research is needed to compare drug-use versions of stage-of-change measures in different contexts to establish whether different approaches may be more reliable and appropriate in different settings. These studies also should include longitudinal investigations of behavior to assess the predictive validity of these different approaches to measuring drug-use stage of change. Based on the current findings, practitioners should use caution when using stage-of-change questionnaires to assign clients to treatments.

Acknowledgments

The research was supported, in part, by Los Angeles County, Office of AIDS Programs and Policy contracts H207568 and H700939, the Universitywide AIDS Research Program contract IS99-CSULB-218, and the City of Long Beach, Department of Health and Human Services contract 24756. Funding was also provided, in part, by the Department of Psychology, California State University, Long Beach, Long Beach, California.

References

- Abellanas L, McLellan AT. 'Stage of change' by drug problem in concurrent opioid, cocaine, and cigarette users. *Journal of Psychoactive Drugs* 1993;25(4):307–313. [PubMed: 8126603]
- Addington J, el-Guebaly N, Duchak V, Hodgins D. Using measures of readiness to change in individuals with schizophrenia. *American Journal of Drug and Alcohol Abuse* 1999;25(1):151–161. [PubMed: 10078983]
- Belding MA, Iguchi MY, Lamb RJ. Stages of change in methadone maintenance: Assessing the convergent validity of two measures. *Psychology of Addictive Behaviors* 1996;10(3):157–166.
- Bellack AS, DiClemente CC. Treating substance abuse among patients with schizophrenia. *Psychiatric Services* 1999;50(1):75–80. [PubMed: 9890583]
- Bentler, PM. *EQS 6 Structural Equations Program Manual*. Multivariate Software, Inc; Encino, CA: 2006.

- Bentler PM, Dudgeon P. Covariance structure analysis: Statistical practice, theory, and directions. *Annual Review of Psychology* 1996;47:563–592.
- Blanchard KA, Morgenstern J, Morgan TJ, Labouvie E, Bux DA. Motivational subtypes and continuous measures of readiness for change: Concurrent and predictive validity. *Psychology of Addictive Behaviors* 2003;17(1):56. [PubMed: 12665082]
- Budd RJ, Rollnick S. The structure of the Readiness to Change Questionnaire: A test of Prochaska & DiClemente's transtheoretical model. *British Journal of Health Psychology* 1996;1(4):365.
- Campbell DT, Fiske D. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin* 1959;56(2):81–105. [PubMed: 13634291]
- Carey KB, Purnine DM, Maisto SA, Carey MP. Assessing readiness to change substance abuse: A critical review of instruments. *Clinical Psychology: Science and Practice* 1999;6(3):245.
- Carey KB, Purnine DM, Maisto SA, Carey MP. Correlates of stages of change for substance abuse among psychiatric outpatients. *Psychology of Addictive Behaviors* 2002;16(4):283–289. [PubMed: 12503900]
- Carney MM, Kivlahan DR. Motivational subtypes among veterans seeking substance abuse treatment: Profiles based on stages of change. *Psychology of Addictive Behaviors* 1995;9(2):135.
- Cole DA. Utility of confirmatory factor analysis in test validation research. *Journal of Consulting and Clinical Psychology* 1987;55(4):584–594. [PubMed: 3624616]
- de Oliveira Júnior HP, Malbergier A. Assessment of motivation for treatment in alcohol dependent patients who sought treatment at a specialized medical service. *Revista Brasileira de Psiquiatria* 2003;25(1):5. [PubMed: 12975673]
- Dowling-Guyer S, Johnson ME, Fisher DG, Needle R, Watters J, Andersen M, et al. Reliability of drug users' self-reported HIV risk behaviors and validity of self-reported recent drug use. *Assessment* 1994;1(4):383–392.
- Edwards JW, Fisher DG, Johnson ME, Reynolds GL, Redpath DP. Test-retest reliability of self-reported drug treatment. *Journal of Substance Abuse Treatment* 2007;33(1):7–11. [PubMed: 17588484]
- Etter JF, Perneger TV. A comparison of two measures of stage of change for smoking cessation. *Addiction* 1999;94(12):1881–1889. [PubMed: 10717966]
- Etter JF, Sutton S. Assessing 'stage of change' in current and former smokers. *Addiction* 2002;97(9):1171–1182. [PubMed: 12199833]
- Farkas AJ, Pierce JP, Gilpin EA, Zhu SH, Rosbrook B, Berry C, et al. Is stage-of-change a useful measure of the likelihood of smoking cessation? *Annals Of Behavioral Medicine* 1996;18(2):79–86.
- Figlie NB, Dunn J, Laranjeira R. Motivation for change in alcohol dependent outpatients from Brazil. *Addictive Behaviors* 2005;30(1):159–165. [PubMed: 15561456]
- Fisher DG, Hoffman P. The adjusted Rand statistic: A SAS macro. *Psychometrika* 1988;53(3):417–423.
- Fisher, DG.; Needle, R.; Weatherby, N.; Brown, B.; Booth, R.; Williams, M. Reliability of drug user self-report. Paper presented at the IXth International Conference on AIDS; Berlin, Germany. 1993.
- Gavin DR, Sobell LC, Sobell MB. Evaluation of the Readiness to Change Questionnaire with problem drinkers in treatment. *Journal of Substance Abuse* 1998;10(1):53–58. [PubMed: 9720006]
- Heather N, Rollnick S, Bell A. Predictive validity of the Readiness to Change Questionnaire. *Addiction* 1993;88:1667–1677. [PubMed: 8130706]
- Heather N, Rollnick S, Bell A, Richmond R. Effects of brief counselling among male heavy drinkers identified on general hospital wards. *Drug and Alcohol Review* 1996;15(1):29. [PubMed: 16203349]
- Henderson MJ, Saules KK, Galen LW. The predictive validity of the University of Rhode Island Change Assessment questionnaire in a heroin-addicted polysubstance abuse sample. *Psychology of Addictive Behaviors* 2004;18(2):106–112. [PubMed: 15238052]
- Hodgins DC. Stages of change assessments in alcohol problems: Agreement across self- and clinician-reports. *Substance Abuse* 2001;22(2):87–96. [PubMed: 12466671]

- Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling* 1999;6:1–55.
- Hubert L, Arabie P. Comparing partitions. *Journal of Classification* 1985;2:193–218.
- Isenhardt CE. Motivational subtypes in an inpatient sample of substance abusers. *Addictive Behaviors* 1994;19(5):463. [PubMed: 7832005]
- Littell JH, Girvin H. Ready or not: Uses of the Stages of Change Model in child welfare. *Child Welfare Journal* 2004;83(4):341–366.
- Maisto SA, Conigliaro J, McNeil M, Kraemer K, O'Connor M, Kelley ME. Factor structure of the SOCRATES in a sample of primary care patients. *Addictive Behaviors* 1999;24(6):879–892. [PubMed: 10628520]
- Marsh HW, Hocevar D. A new, more powerful approach to multitrait-multimethod analyses: Application of second-order confirmatory factor analysis. *Journal of Applied Psychology* 1988;73(1):107–117.
- McConaughy EA, Prochaska JO, Velicer WF. Stages of change in psychotherapy: Measurement and sample profiles. *Psychotherapy: Theory, Research and Practice* 1983;20:368–375.
- Miller WR, Tonigan JS. Assessing drinkers' motivations for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors* 1996;10(2): 81–89.
- Mitchell D, Francis JP, Tafrate RC. The psychometric properties of the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) in a clinical sample of active duty military service members. *Military Medicine* 2005;170(11):960–963. [PubMed: 16450824]
- National Institute on Drug Abuse. Risk behavior assessment. National Institute on Drug Abuse (Community Research Branch); Rockville, MD: 1993.
- Needle R, Fisher DG, Weatherby N, Chitwood D, Booth R, Watters J, et al. Reliability of self-reported HIV risk behaviors of drug users. *Psychology of Addictive Behaviors* 1995;9(4):242–250.
- Nochajski TH, Stasiewicz PR. Assessing stages of change in DUI offenders: A comparison of two measures. *Journal of Addictions Nursing* 2005;16(1):57–67.
- Pantalon MV, Swanson AJ. Use of the University of Rhode Island Change Assessment to measure motivational readiness to change in psychiatric and dually diagnosed individuals. *Psychology of Addictive Behaviors* 2003;17(2):91. [PubMed: 12814272]
- Prochaska, JO.; DiClemente, CC. Toward a comprehensive model of change. In: Miller, WR.; Heather, N., editors. *Treating Addictive Behaviors: Processes of Change*. Plenum Press; New York: 1986. p. 3-27.
- Prochaska, JO.; DiClemente, CC. Stages of change in the modification of problem behaviors. In: Hersen, M.; Miller, PM.; Eisler, R., editors. *Progress in Behavior Modification*. Vol. Vol. 28. Wadsworth Publishing Company; New York: 1992. p. 184-218.
- Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: Applications to addictive behaviors. *American Psychologist* 1992;47(9):1102–1114. [PubMed: 1329589]
- Rainof, A.; Rodríguez, JC.; Fisher, DG.; Muñoz, JF. A Spanish-English SOCRATES for assessment of sexual risk stages of change (Session 4144.0). 130th Annual Meeting of the American Public Health Association; Philadelphia, PA. 2002.
- Rollnick S, Heather N, Gold R, Hall W. Development of a short "readiness to change" questionnaire for use in brief, opportunistic interventions among excessive drinkers. *British Journal of Addiction* 1992;87(5):743–754. [PubMed: 1591525]
- Sutton S. Back to the drawing board? A review of applications of the transtheoretical model to substance use. *Addiction* 2001;96(1):175–186. [PubMed: 11177528]
- Velicer WF, Prochaska JO, Fava JL, Norman GJ, Redding CA. Smoking cessation and stress management: Applications of the transtheoretical model of behavior change. *Homeostasis in Health and Disease* 1998;38(5):216–233.
- Weatherby NL, Needle R, Cesari H, Booth R, McCoy CB, Watters JK, et al. Validity of self-reported drug use among injection drug users and crack cocaine users recruited through street outreach. *Evaluation and Program Planning* 1994;17(4):347–355.
- Willoughby FW, Edens JF. Construct validity and predictive utility of the stages of change scale for alcoholics. *Journal of Substance Abuse* 1996;8(3):275–291. [PubMed: 8934434]

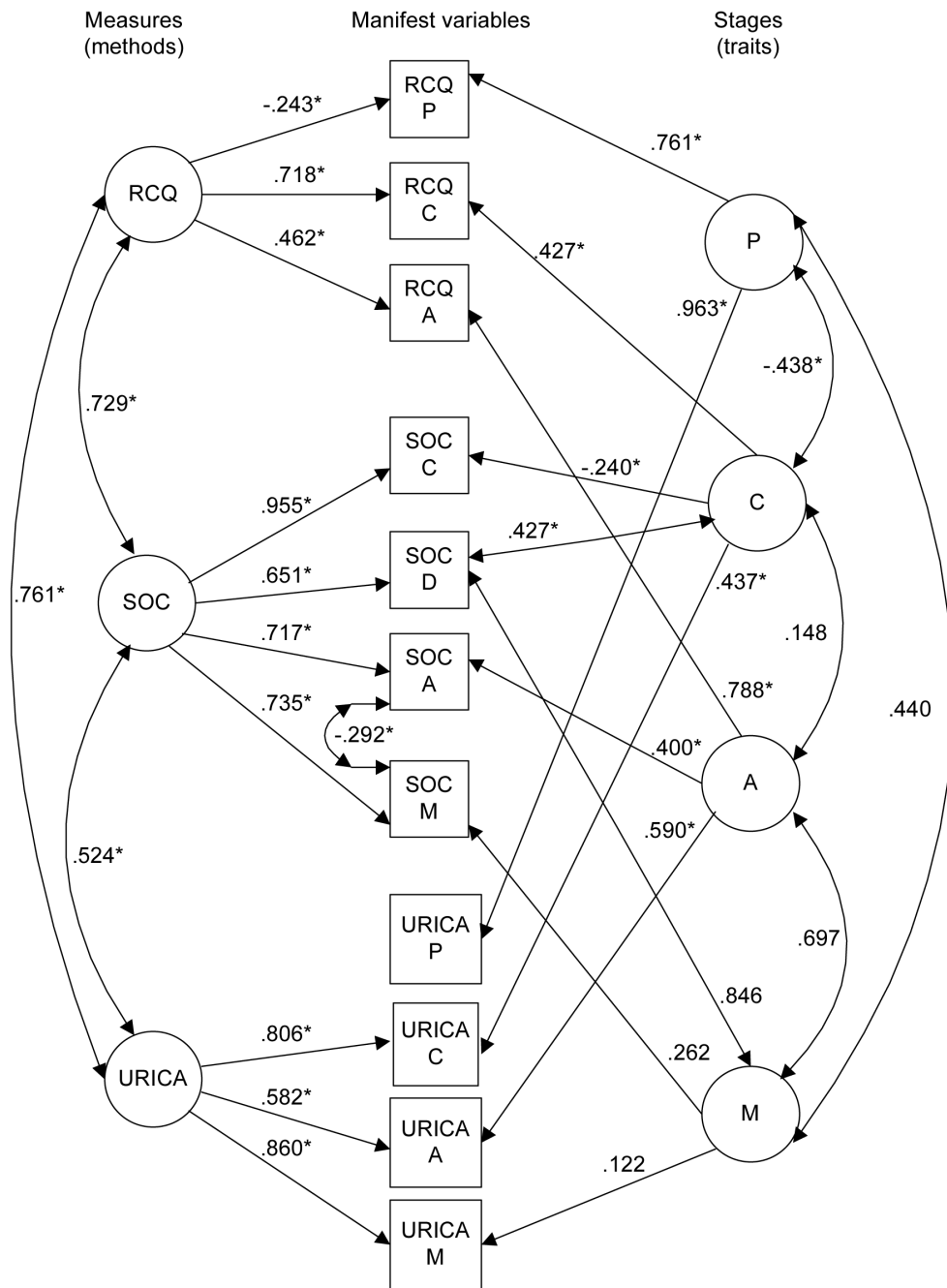


Figure 1. Multi-trait multi-method figure illustrating the relationships between methods (stage-of-change measures), traits (stages of change), and manifest variables (subscales). SOC = SOCRATES; P = precontemplation; C = contemplation; D = determination; A = action; M = maintenance.
 * $p < .05$.

Table 1

Reliability of the URICA, SOCRATES and RCQ

Subscale	Items	M	SD	Coefficient alpha	Mean item-total correlation
URICA: (<i>n</i> = 293)					
P	7	2.27	0.96	.82	.56
C	7	4.37	0.65	.87	.66
A	7	3.90	0.85	.90	.70
M	7	3.94	0.76	.81	.54
SOCRATES: (<i>n</i> = 377)					
P	3	7.25	3.66	.60	.42
C	4	14.32	3.45	.40	.22
D	4	16.52	3.16	.51	.33
A	4	15.51	3.67	.65	.44
M	4	14.97	3.18	.32	.17
RCQ: (<i>n</i> = 239)					
P	4	-3.49	4.11	.68	.47
C	4	5.08	3.19	.65	.43
A	4	2.41	4.93	.89	.76

Note. P = precontemplation; C = contemplation; D = determination; A = action; M = maintenance.

Table 2

Percentage of participants assigned to stages of change on the URICA, RCQ and the SOCRATES.

RCQ:	URICA				RCQ			
	P	C	A	M	P	C	A	M
P	19.4	3.9	5.6	6.0				
C	4.3	10.8	3.4	10.8				
A	2.2	7.3	15.5	10.8				
SOCRATES:								
P	14.1	5.1	6.5	3.5	18.8	3.3	7.9	
C	7.8	4.3	2.4	6.5	6.3	7.5	5.4	
D	3.5	6.2	3.2	3.8	3.8	9.6	3.3	
A	3.8	2.7	5.9	4.3	2.9	3.3	10.0	
M	5.4	2.7	4.3	3.8	4.2	5.4	7.9	

Note. P = precontemplation; C = contemplation; D = determination; A = action; M = maintenance. The precontemplation stage of the SOCRATES was reverse coded, such that those assigned to the precontemplation stage reported low recognition of their problem. URICA/ RCQ sample size, $n = 155$. URICA/SOCRATES sample size, $n = 293$. RCQ/SOCRATES sample size, $n = 239$.

Table 3

Participants' drug use behavior by stage of change

	P	C	D	A	M	df	F	η^2
URICA								
Times injected drugs ^a	25.7 (48.4)	41.4 (62.6)	11.3 (26.8)	16.1 (32.3)	3,138	2.77*	0.06	
Weeks in drug ^a treatment	27.6 (52.3)	40.2 (68.1)	39.0 (84.1)	36.3 (58.5)	3,289	0.66		
Days used drugs ^b	15.4 (11.2)	16.5 (11.0)	16.5 (11.2)	16.2 (11.1)	3,341	0.19		
RCQ								
Times injected drugs ^a	42.1 (58.0)	26.1 (40.3)	11.8 (28.0)		2,89	3.80*	0.08	
Weeks in drug ^a treatment ^a	26.7 (54.5)	54.8 (89.2)	46.3 (88.1)		2,237	3.54*	0.03	
Days used drugs ^b	19.2 (10.7)	17.8 (10.3)	12.6 (10.4)		2,218	8.35***	0.07	
SOCRATES								
Times injected drugs ^a	33.5 (56.2)	22.8 (40.2)	37.2 (52.9)	13.5 (43.1)	9.5 (24.3)	4,141	2.22	
Weeks in drug ^a treatment ^a	28.7 (78.5)	28.6 (49.0)	62.8 (86.9)	35.2 (50.8)	35.5 (67.1)	4,372	6.24***	0.06
Days used drugs ^b	18.2 (10.8)	15.4 (11.4)	19.3 (10.3)	11.7 (9.9)	14.2 (10.3)	4,348	5.32***	0.06

Note. Standard deviations are in parentheses. P = precontemplation; C = contemplation; D = determination; A = action; M = maintenance.

^a Although raw data are reported in the table, the analyses were conducted on log transformed data.

^b Drug use in the past 30 days.

* $p < .05$.

*** $p < .001$.