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The Relationship between Recovery and Health-Related Quality of Life

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Abstract

Building upon recommendations to broaden the conceptualization of recovery and to assess its relationship with health-related quality of life (HRQoL), this study addressed three primary aims. These included: 1) Testing the model fit of a hypothesized latent measure of recovery, 2) Examining the extent to which this multidimensional measure of recovery was associated with concurrently measured HRQoL, and 3) Examining the extent to which this multidimensional measure of recovery predicted changes in HRQoL during the subsequent year. Data were from 1,008 adults who completed follow-up assessments at 15 and 16 years post-intake. Confirmatory factor analysis indicated a good fit for a hypothesized recovery measure (CFI = .98; RMSEA = .06). Additionally, structural equation modeling suggested that this recovery measure was not only concurrently associated with HRQoL ($\beta = .78, p < .001$), but was also a significant predictor of changes in HRQoL during the subsequent year ($\beta = .25, p < .001$).

1. Introduction

Recovery is a multidimensional concept that goes well beyond abstinence. Alcoholics Anonymous' (1939) *Big Book* provided a key turning point for the recovery movement when it described the process of recovery as not only involving abstinence from alcohol, but also developing new strategies for living sober across a number of domains. Similarly, Jellnick's (1960) *The Disease Concept of Alcoholism* defined both the descent into alcoholism and recovery in terms of use and abstinence, as well as in terms of the vast array of problems resulting for the individuals, their family, and society. In the second key turning point of the recovery movement, Edwards and Gross (1976) defined the "alcohol dependence syndrome" which was subsequently generalized to other drugs, and today remains the foundation for the modern definition of substance use disorders (SUD; APA, 2013). Thus, while substance "use" is a necessary condition for SUD to occur, it is interesting to note that no amount of use or abstinence are part of the definition of either having an SUD or being in remission/recovery. Given that recovery support services are included in the Affordable Care Act Essential Benefits (45 CFR part 156) with the likely

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consequential push to evaluate these services, there is an increasingly urgent need to advance the field in terms of defining recovery, as well as the development and validation of recovery measures.

While there has been considerable research on the definition, reliability, and validity of SUD as a measure of the problem, much less work has been done to date on defining, validating, and measuring “recovery.” There is, however, a growing consensus that recovery is more than simply abstinence from alcohol and other drugs (Betty Ford Institute Consensus Panel, 2007; IOM, 2006; Kaskutas et al., this issue; Laudet, 2007, 2008; Maddux & Desmond, 1986; SAMHSA, 2012; White, 2007, 2012; Witkiewitz, 2013). While these groups vary in how they define recovery, most conceptualize recovery as being multidimensional and including abstinence/sobriety, as well as improvements in other problems (e.g., mental or physical), and satisfaction with environment and relationships with others (referred to as “citizenship” by the Betty Ford Institute Consensus Panel).

Across many chronic conditions, there has been a parallel growing interest in going beyond just reduction in disease-specific symptoms to also evaluate course and interventions in terms of measures of Quality of Life or Health-Related Quality of Life (HRQoL) measures (Donovan, Mattson, Cisler, Longabaugh, & Zweben, 2005; Gold, Siegel, Russell, & Weinstein, 1996; Laudet, 2011; Morgan, Morgenstern, Blanchard, Labouvie, & Bux, 2003; Saarni et al., 2006). HRQoL typically focus on the effects of a disease on an individual’s health and have been the focus of early research in the SUD field (Burgess et al., 2000; Tracy et al., 2012). In general, the extant literature suggests that “samples” who report having an SUD, also report poor HRQoL (e.g., De Maeyer, Vanderplasschen, & Broekaert, 2010; Karow et al., 2010; Morgan et al., 2003; Nosyk et al., 2011; Preau et al., 2007; Robinson, 2006). Nonetheless, several researchers have noted that HRQoL research within the addictions field remains stalled in the early stages and has yet to examine its relation to a broader measure of recovery as discussed above (Laudet, 2011; Tracy et al., 2012).

In an effort to build upon both recommendations to broaden the conceptualization of recovery and to assess its relationship to HRQoL as an additional outcome of importance, the current study sought to address three primary aims: 1) Test the model fit of a hypothesized latent measure of recovery, 2) Examine the extent to which this multidimensional measure of recovery is associated with concurrently measured HRQoL, and 3) Examine the extent to which this multidimensional measure of recovery predicts changes in HRQoL during the subsequent year.

2. Methods

2.1 Data Source

Data are from the *Pathways to Recovery Study* (e.g., Dennis, Foss, & Scott, 2007; Dennis, Scott, Funk, & Foss, 2005; Scott, Foss, & Dennis, 2005; Scott, Dennis, Laudet, Funk, & Simeone, 2011), which is a longitudinal study that began in 1996. Between 1996 and 1998 a cohort of 1,326 adults (85% participation rate) were recruited from sequential admissions to a network of 22 substance use treatment programs, which included: ten outpatient drug-free programs, five intensive outpatient drug-free programs, three methadone maintenance

programs, two short-term inpatient programs, one long-term inpatient program, and one halfway house. In order to be eligible, participants had to: a) reside in the city of Chicago or declare themselves homeless, b) report alcohol or drug use in the past 6 months (or the 6 months before being in a controlled environment), c) present for treatment at one of the publicly-funded treatment programs in the study, and d) be 18 years of age or older. Individuals seeking treatment as a result of a DUI Level 2 or higher conviction were excluded because their treatment placement decisions were typically made outside the treatment system being studied (i.e., by a court officer). Informed and voluntary consent to participate was sought under the supervision of the state's and Chestnut Health Systems' Institutional Review Board.

2.2 Study Procedures

Utilizing the follow-up management model described by Scott (2004), participants were interviewed at 6-months, 18-months, 2-years, 3-years, 4-years, 5-years, 6-years, 7-years, 8-years, 9-years, 15-years, and 16-years post-intake, with year-17 and year-18 currently scheduled to be completed. Participants received \$100 for completion of the year-15 interview and \$110 for completion of the year-16 interview. For both interviews, participants received an additional \$10 if they completed their interview within 7 days of the targeted follow-up date. On average, each interview lasted 128 minutes.

2.3 Study Participants

Participants for the current study were those individuals who completed follow-up interviews at both years-15 and 16 ($N = 1,008$; 93% of eligible sample), which were the first two years that included measures of HRQoL (i.e., primary dependent measure for the current study). The sample was predominately female (63%) and African American (90%) with an average age of 48 ($SD = 7.3$) at the year-15 interview. Clinically, 87% of the sample self-reported criteria for lifetime SUDs based on the new criteria in the *Diagnostic and Statistical Manual Version V* (DSM-V; APA, 2013), including for cocaine (49%), opiates (33%), alcohol (20%), and/or marijuana (5%). Many also reported major co-occurring problems related to physical health (41%), or disabilities (23%), and/or mental health (34%), or cognitive impairment (11%). At the time of the year-15 interview, 32% were in full sustained remission (no symptoms for past-year while living in the community), 6% were incarcerated, 24% were in treatment, and 37% were still using substances in the community. At the time of the year-16 interview, 44% were in full sustained remission (no symptoms for past-year while living in the community), 6% were incarcerated, 13% were in treatment, and 44% were still using substances in the community.

2.4 Measures

2.4.1 Recovery Measures—As also noted in the Introduction, there is growing consensus that the conceptualization of recovery should not be restricted to measures of abstinence/sobriety, but should be expanded to include other important dimensions. Below are descriptions of several measures that were collected as part of the *Pathways to Recovery Study* and which we believe most fully and accurately represent the key dimensions of recovery posited by others (e.g., Betty Ford Institute Consensus Panel, 2007; IOM, 2006;

Kaskutas et al., this issue; Laudet, 2007, 2008; Maddux & Desmond, 1986; SAMHSA, 2012; White, 2007, 2012; Witkiewitz, 2013). Table 1 provides descriptive statistics for each of the study measures, which are described below.

Physical and Mental Health Problems were assessed using the Addiction Severity Index's (McLellan et al., 1992) medical composite score and psychological composite score. The medical composite score is a composite of the number of days participants have been bothered by any health or medical problems, how bothered they were by these problems, and how important treatment was for these problems. The psychological composite score is the average of seven past-month types of psychological problems (e.g., whether they took prescribed medication in the past month; days experienced these problems divided by 30 days; a 0 to 4 rating of how bothered they were by these problems, and how important treatment was for these problems, each divided by 4).

Sobriety was defined in terms of years of continuous abstinence from alcohol and other drugs using the Longitudinal Expert All Data (LEAD) standard (Dennis et al., 2007; Kranzler, Tennen, Babor, Kadden, & Rounsaville, 1997). This measure represents the total number of years of abstinence from alcohol and other drug use reported by the participant as of the 15-year interview. If they reported any use in the past year or were positive on a urine screen, this was reduced to 0. Years of abstinence was also reduced based on if they reported more recent use or had a positive urine screen more recently at any earlier wave of data collection. As part of sensitivity analyses, we evaluated "percent of time abstinent" and "duration of continuous abstinence" as alternative measures, but years of continuous abstinence resulted in the best model fit.

Satisfaction with Environment and Relationships was measured with the General Satisfaction Index (GSI; Dennis, Titus, White, Unsicker, & Hodgkins, 2003). The GSI is a sum of six yes/no questions that ask participants to indicate if they are satisfied with: 1) where they are living, 2) their family relationships, 3) their sexual or marital relationships, 4) their school or work situations, 5) how they spend their free time, and 6) the extent to which they are coping with or getting help with their problems.

Daily Functioning was measured using the Activities of Daily Living scale from the Center for Disease Control's Behavioral Risk Factor Surveillance System (<http://www.cdc.gov/brfss/>). The Activities of Daily Living scale represents the average of 13 items that assess the extent to which individuals need help with several daily activities (e.g., take care of yourself, such as eating, bathing, grooming, dressing or going to the bathroom; take care of your residence or personal living space, such as cleaning, laundry, preparing meals, yard work or managing money). Possible response categories ranged from 0 (no additional help) to 3 (unable to do, even with additional help).

2.4.2 Health-Related Quality of Life—The dependent variable for this study was HRQoL and was assessed using the European Quality of Life 5 Dimensions (EQ-5D; Brooks, 1996; EuroQol Group, 1990; Shaw, Johnson, & Coons, 2005). Recommended by the National Institute of Health's Data Harmonization project for use across all conditions (see www.phenx.org), the EQ-5D is a standardized instrument for use as a measure of health

outcome and is applicable to a wide range of health conditions and treatments. Additionally, it is known for being reliable, valid, efficient, and inexpensive. The EQ-5D asks participants to rate the degree to which (e.g., none, some, extreme) they are experiencing problems along five dimensions of health: 1) mobility, 2) self-care, 3) usual activities, 4) pain/discomfort, and 5) anxiety/depression. Additionally, data from a visual analogue scale, which ranges from 0 (worst imaginable health) to 100 (best imaginable health), are also included as part of the EQ-5D measure. The current study used the norms and time tradeoff valuations developed for the U.S. population (Shaw et al., 2005).

2.5 Analytic Procedures

Amos structural equation modeling software (Arbuckle, 2008) was used to conduct each of the analyses. Confirmatory factor analysis was conducted on our hypothesized latent measure of recovery, and model fit was evaluated using several standard fit indices, including the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). RMSEA should be less than .1, with values less than .08 being a moderate fit, less than .06 being a very good fit, and less than .05 excellent (Browne & Cudeck, 1993; Hu & Bentler, 1999; Lennox, Dennis, Scott, & Funk, 2006). The CFI ranges from 0 to 1; with values greater than .95 indicating very good fit (Bentler, 1990; Hu & Bentler, 1999). Subsequent to the confirmatory factor analysis, we conducted a series of analyses to examine bi-variate relationships between each of the year-15 measures of interest, as well as a series of analyses to examine the extent to which each of these year-15 measures predicted change in HRQoL (i.e., year-16 HRQoL controlling for year-15 HRQoL).

3. Results

3.1 Recovery as a Latent Measure

Figure 1 presents results of the confirmatory factor analysis of our hypothesized latent measure of recovery. Fit indices indicated a very good fit in terms of both CFI (.98) and RMSEA (.06). The five factor loadings ranged from aspects of recovery where we want to see things reduced, such as psychological problems (−.74) and medical problems (−.58), to aspects of recovery we want to see increased, such as sobriety (+.20), satisfaction with environment and relationships (+.45), and daily functioning (+.75). Thus, these various concepts do, in fact, co-vary and appear to represent a previously unidentified common underlying dimension of recovery.

3.2 Concurrent Relationships with Year-15 HRQoL

Table 2 presents results from the series of bi-variate analyses between each of the study's independent measures of interest at year-15 and the concurrently measured HRQoL. Each of the measures examined had a statistically significant ($p < .001$) association with the concurrent year-15 HRQoL. *Physical Health Problems* explained 33.7%, *Mental Health Problems* explained 24.5%, *Sobriety* explained 1.5%, *Satisfaction with Environment and Relationships* explained 6.2%, and *Daily Functioning* explained 33.2%. Per Dennis, Lennox, & Foss (1997), we interpret percent of variance as a small (1%), moderate (2%) and large (3.1%) effect. Although the percentage of variance explained by *Sobriety* was lower than the other measures, this percent variance explained is equivalent to a small effect. The latent

measure of recovery based on the combination of these measures explained the 60.5% of the variance in year-15 HRQoL. Thus, although each measure individually predicts HRQoL, the combined latent construct of recovery explained the most variance in year-15 HRQoL.

3.3 Predictors of Change in Year-16 HRQoL

Table 3 presents results from the series of analyses that examined the extent to which each of the study's independent measures of interest predicted year-16 HRQoL after controlling for year-15 HRQoL. After controlling for participants' year-15 HRQoL, year-16 HRQoL was significantly higher among participants reporting lower *Physical Health Problems* ($\beta = -.129$), lower *Mental Health Problems* ($\beta = -.096$), as well as higher *Daily Functioning* ($\beta = .112$), and the combined latent measure of recovery ($\beta = .245$). These analyses, however, did not reveal year-15 *Sobriety* or *Satisfaction with Environment and Relationships* as significant predictors of change in HRQoL in the coming year. Results of the study's final model, which examined the extent to which a latent measure of recovery (measured at year-15) was predictive of subsequent change in participants' HRQoL, are presented in Figure 2. According to this model, each recovery indicator was statistically significant ($p < .001$). Overall, this model explained 42% of the variance in year-16 HRQoL.

4. Discussion

4.1 Reprise of Key Findings

Using data from a large sample, which was heterogeneous in terms of their current state of recovery, the current study focused on the examination of a multidimensional measure of recovery and its relationship to HRQoL. In addition to confirmatory factor analyses suggesting a good fit of our hypothesized model of recovery (i.e., CFI = .98; RMSEA = .06), results of structural equation modeling suggested recovery was not only concurrently associated with HRQoL ($\beta = .78, p < .001$), but was also a significant predictor of changes in HRQoL during the subsequent year ($\beta = .25, p < .001$). These findings are consistent with research that has shown HRQoL improves with abstinence (Foster, Marshall, & Peters, 2000; Kraemer, Wilson, Fairburn, & Agras, 2002; Villeneuve et al., 2006) and the more general move to include such measures as a major outcome when evaluating the effectiveness of treatment for chronic conditions in general (Donovan et al., 2005; Gold et al., 1996; Laudet, 2011; Morgan et al., 2003; Saarni et al., 2006). Additionally, consistent with research that has found substance use to be predictive of quality of life (Becker, Curry, & Yang, 2009), we found sobriety to be significantly related to HRQoL. Conversely, the fact that it only accounted for a small percent of the variance (1.5%) suggests that sobriety alone is not a sufficient measure or proxy of recovery.

Relative to the national norms (Pereira, Palta, Mullahy, & Fryback, 2011) for the EQ5D adjusted for gender and race, the scores here were lower than the average (.78 vs .80) and at the lower bound of the adjusted 95% confidence intervals (.78 to .84). If we look at the participants in this case according to their current status, those in full remission had significantly better scores than those using substances in the community or who were just entering treatment (.80 vs .77 and .74). This is consistent with prior research that has found HRQoL to be lower among people currently using substances and/or entering treatment (De

Maeyer et al., 2010; Karow et al., 2010; Morgan et al., 2003; Nosyk et al., 2011; Preau et al., 2007; Robinson, 2006).

4.2 Key Implications for Research, Policy, and Practice

Consistent with the increasing recognition of addiction as a chronic illness (Dennis & Scott, 2007; Dennis et al., 2005; McLellan, Lewis, O'Brien, & Kleber, 2000), there have been a number of key policy changes to support the expansion of addiction services. Most notable are the Paul Wellstone and Peter Domenici Mental Parity and Addiction Equity Act of 2008 (Public Law 110–344) and the Affordable Care Act of 2010 (Public Law 111–148). Parallel to these changes have been increasing efforts to shift the addiction field toward more widespread use of what are referred to as Recovery Oriented Systems of Care (ROSC), which represents a multi-system, person-centered continuum of care (Clark, 2012). The lack of a well-defined, multidimensional, and psychometrically valid measure of recovery has been cited as a barrier towards this goal (Laudet & Humphreys, 2013). Thus, the current study's support for a multidimensional measure of recovery represents a significant opportunity to remove an impediment to progress in the field and may ultimately serve as an important contribution to guide future research, policy, and practice. Like other chronic health conditions substance use and recovery are related to health-related costs and quality of life. Sobriety as measured by the duration of abstinence alone was not a very good proxy for HRQoL. With the inclusion of recovery support services in the ACA's essential health benefit, there are growing calls for their evaluation. Such efforts should ideally include HRQoL type measures to provide a more sensitive metric.

4.3 Strengths and Limitations

The current study had several strengths, including a large sample size, 16-year longitudinal data, high follow-up rates, and use of several standardized measures; however, it is important to also acknowledge some of the study's limitations. First, study participants were primarily minority females from an urban area. As such, a limitation is that the extent to which the current findings generalize to other samples is not yet known. Second, despite the longitudinal nature of the study, we cannot address the causal relationship between recovery and HRQoL. Third, the current analyses did not control for participant factors, including demographic characteristics or clinical severity. Thus, future research examining the relationship between recovery and HRQoL may want to include these measures as control and/or moderator variables.

4.4 Directions for Future Research

The current study provided evidence supporting a multidimensional measure of recovery that was found to be significantly related to both concurrent HRQoL, as well as predictive of change in HRQoL during the subsequent year. In terms of moving forward, however, there are a number of issues future research will need to address. First, while this paper serves as a valuable starting point, there is the need for further consideration of what other dimensions, if any, should be included as part of a multidimensional definition of recovery. Second, in addition to determining the specific dimensions that make up recovery, is the clarification needed to determine what White (2007) described as the "temporal benchmarks of

recovery.” Thus, in addition to the need to determine the *time period* (e.g., today, during past- week, during past-30 days, during past 6-months, during past-year, since initiation of abstinence) at which these dimensions of recovery should be assessed, is the need to determine whether the time period assessed should be *equivalent* across dimensions or can vary by dimension. As noted, we have already seen differences in a wide range of problems by duration of recovery (see Dennis et al., 2007) and presume the same would be true for this expanded definition of recovery. Third, upon agreement of the recovery dimensions and time period(s) to be assessed will be the need to develop a benchmark of normative functioning. That is, at what point along the continuum of recovery will an individual now be considered to be “in recovery,” or even better, “recovered?” Such end points are considered essential in Federal Drug Administration (FDA) applications for new medical treatments. Fourth, there is a need for research to better understand the temporal relationship between recovery and quality of life. Using a cross-lagged panel design, Becker et al. (2009) found that frequency of substance use predicted subsequent quality of life, but that quality of life did not predict subsequent frequency of substance use. Thus, we recommend future research seek to explore the cross-lagged relationships between multidimensional measures of recovery and HRQoL measures. As part of the current project, collection of year-17 data is currently underway, with the collection of year-18 data to follow. As these data become available, our team will seek to further explore these and other important questions related to the often lengthy and challenging, yet achievable, process known as recovery.

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References

- Alcoholics Anonymous. Alcoholics Anonymous. New York: AA World Services; 1939.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-V. Washington, DC: American Psychiatric Association; 2013.
- Arbuckle, JL. Amos (Version 17.0) [Computer Program]. Chicago: SPSS; 2008.
- Becker SJ, Curry JF, Yang C. Longitudinal association between frequency of substance use and quality of life among adolescents receiving a brief outpatient intervention. *Psychology of Addictive Behaviors*. 2009; 23:482–490. [PubMed: 19769432]
- Bentler PM. Comparative fit indexes in structural models. *Psychological Bulletin*. 1990; 107:238–246. [PubMed: 2320703]
- Betty Ford Institute Consensus Panel. What is recovery? A working definition from the Betty Ford Institute. *Journal of Substance Abuse Treatment*. 2007; 33:221–228. [PubMed: 17889294]
- Brooks R. EuroQol: The current state of play. *Health Policy*. 1996; 37:53–72. [PubMed: 10158943]
- Browne MW, Cudeck R. Alternative ways of assessing model fit. *Sociological Methods and Research*. 1993; 21:230–258.
- Burgess AP, Carretero M, Elkington A, Pasqual-Marsettin E, Lobaccaro C, Catalan J. The role of personality, coping style and social support in health-related quality of life in HIV infection. *Quality of Life Research*. 2000; 9:423–437. [PubMed: 11131935]
- Clark, HW. A model for recovery-oriented systems of care from a national perspective; Las Vegas, NV. Presented at the 13th annual NCRG Conference on Gambling and Addiction; 2012 Sep-Oct. 2012

- De Maeyer J, Vanderplasschen W, Broekaert E. Quality of life among opiate-dependent individuals: A review of the literature. *International Journal of Drug Policy*. 2010; 21:364–380. [PubMed: 20172706]
- Dennis ML, Foss MA, Scott CK. An eight-year perspective on the relationship between the duration of abstinence and other aspects of recovery. *Evaluation Review*. 2007; 31:585–612. [PubMed: 17986709]
- Dennis, ML.; Lennox, RD.; Foss, MA. Practical power analysis for substance abuse health services research. In: Bryant, KJ.; Windle, M.; West, SG., editors. *The science of prevention: Methodological advances from alcohol and substance abuse research*. Washington, DC: American Psychological Association; 1997.
- Dennis ML, Scott CK. Managing addiction as a chronic condition. *Addiction Science and Clinical Practice*. 2007; 4(1):45–55. [PubMed: 18292710]
- Dennis ML, Scott CK, Funk R, Foss MA. The duration and correlates of addiction and treatment careers. *Journal of Substance Abuse Treatment*. 2005; 28:s51–s62. [PubMed: 15797639]
- Dennis, ML.; Titus, JC.; White, M.; Unsicker, J.; Hodgkins, D. *Global Appraisal of Individual Needs (GAIN): Administration guide for the GAIN and related measures*. Bloomington, IL: Chestnut Health Systems; 2003. Retrieved on 10/17/2013 from www.gaincc.org/gaini (Version 5)
- Donovan D, Mattson ME, Cisler RA, Longabaugh R, Zweben A. Quality of life as an outcome measure in alcoholism treatment research. *Journal of Studies on Alcohol*. 2005; 66(Suppl 15):119–139.
- Edwards G, Gross MM. Alcohol dependence: Provisional description of a clinical syndrome. *British Medical Journal*. 1976; 1:1058–1061. [PubMed: 773501]
- EuroQol Group. EuroQol—A new facility for the measurement of health-related quality of life. *Health Policy*. 1990; 16:199–208. [PubMed: 10109801]
- Foster JH, Marshall EJ, Peters TJ. Application of a quality of life measure, the life satisfaction survey (LSS), to alcohol-dependent subjects in relapse and remission. *Alcoholism: Clinical and Experimental Research*. 2000; 24:1687–1692.
- Gold, MR.; Siegel, JE.; Russell, LB.; Weinstein, MC. *Cost-effectiveness in health and medicine*. New York: Oxford University Press; 1996.
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999; 6:1–55.
- Institute of Medicine. *Improving the quality of health care for mental and substance-use conditions: Quality chasm series*. Washington, DC: National Academy Press; 2006.
- Jellinek, EM. *The disease concept of alcoholism*. New Haven, CT: Hillhouse; 1960.
- Karow A, Reimer J, Schäfer I, Krausz M, Haasen C, Verthein U. Quality of life under maintenance treatment with heroin versus methadone in patients with opioid dependence. *Drug and Alcohol Dependence*. 2010; 112:209–215. [PubMed: 20728288]
- Kaskutas LA, Borkman T, Laudet A, Ritter L, Witbrodt J, Subbaraman M, Bond J. “What is recovery?”: A psychometrically-valid definition reflecting diverse pathways to recovery. *Journal of Substance Abuse Treatment*.
- Kraemer HC, Wilson GT, Fairburn CG, Agras WS. Mediators and moderators of treatment effects in randomized clinical trials. *Archives of General Psychiatry*. 2002; 59:877–883. [PubMed: 12365874]
- Kranzler HR, Tennen H, Babor TF, Kadden RM, Rounsaville BJ. Validity of the longitudinal, expert, all data procedure for psychiatric diagnosis in patients with psychoactive substance use disorders. *Drug and Alcohol Dependence*. 1997; 45:93–104. [PubMed: 9179511]
- Laudet AB. What does recovery mean to you? Lessons from the recovery experience for research and practice. *Journal of Substance Abuse Treatment*. 2007; 33:243–256. [PubMed: 17889296]
- Laudet AB. The road to recovery: Where are we going and how do we get there? Empirically-driven conclusions and future directions for service development and research. *Substance Use and Misuse*. 2008; 43:2001–2020. [PubMed: 19016176]
- Laudet AB. The case for considering quality of life in addiction research and clinical practice. *Addiction Science and Clinical Practice*. 2011; 6:44–55. [PubMed: 22003421]

- Laudet AB, Humphreys K. Promoting recovery in an evolving policy context: What do we know and what do we need to know about recovery support services? *Journal of Substance Abuse Treatment*. 2013; 45:126–133. [PubMed: 23506781]
- Lennox R, Dennis ML, Scott CK, Funk R. Combining psychometric and biometric measures of substance use. *Drug and Alcohol Dependence*. 2006; 83:95–103. [PubMed: 16368199]
- Maddux, FF.; Desmond, DP. Relapse and recovery in substance abuse careers. In: Tims, F.; Leukefeld, C., editors. *Relapse and recovery in drug abuse*. Vol. 72. Rockville, MD: National Institute on Drug Abuse; 1986. p. 49-72. NIDA Monograph
- McLellan AT, Kushner H, Metzger D, Peters R, Smith I, Grissom G, ... Argeriou M. The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment*. 1992; 9:199–213. [PubMed: 1334156]
- McLellan AT, Lewis DC, O'Brien CP, Kleber HD. Drug dependence, a chronic medical illness: Implications for treatment, insurance, and outcomes evaluation. *Journal of the American Medical Association*. 2000; 284:1689–1695. [PubMed: 11015800]
- Morgan TJ, Morgenstern J, Blanchard KA, Labouvie E, Bux DA. Health-related quality of life for adults participating in outpatient substance abuse treatment. *The American Journal on Addictions*. 2003; 12:198–210. [PubMed: 12851016]
- Nosyk B, Guh DP, Sun H, Oviedo-Joekes E, Brissette S, Marsh DC, ... Anis AH. Health related quality of life trajectories of patients in opioid substitution treatment. *Drug and Alcohol Dependence*. 2011; 118:259–264. [PubMed: 21546173]
- Patient Protection and Affordable Care Act, 42 U.S.C. § 18001. 2010
- Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008, H.R. 6983, 110th Cong. 2008
- Pereira CC, Palta M, Mullahy J, Fryback DG. Race and preference-based health-related quality of life measures in the United States. *Quality of Life Research*. 2011; 20:969–978. [PubMed: 21181447]
- Préau M, Protopopescu C, Spire B, Sobel A, Dellamonica P, Moatti J-P, Carrieri MP. Health related quality of life among both current and former injection drug users who are HIV-infected. *Drug and Alcohol Dependence*. 2007; 86:175–182. [PubMed: 16930864]
- Robinson R. Health perceptions and health-related quality of life of substance abusers: A review of the literature. *Journal of Addictions Nursing*. 2006; 17:159–168.
- Saarni SI, Harkanen T, Sintonen H, Suvisaari J, Koskinen S, Aromaa A, Lonnqvist J. The impact of 29 chronic conditions on health-related quality of life: A general population survey in Finland using 15D and EQ-5D. *Quality of Life Research*. 2006; 15:1403–1414. [PubMed: 16960751]
- Scott CK. A replicable model for achieving over 90% follow-up rates in longitudinal studies of substance abusers. *Drug and Alcohol Dependence*. 2004; 74:21–36. [PubMed: 15072804]
- Scott CK, Dennis ML, Laudet A, Funk RR, Simeone RS. Surviving drug addiction: The effect of treatment and abstinence on mortality. *American Journal of Public Health*. 2011; 101:737–744. [PubMed: 21330586]
- Scott CK, Foss MA, Dennis ML. Pathways in the relapse—treatment—recovery cycle over 3 years. *Journal of Substance Abuse Treatment*. 2005; 28:S63–S72. [PubMed: 15797640]
- Shaw JW, Johnson JA, Coons SJ. US valuation of the EQ-5D health states: Development and testing of the D1 valuation model. *Medical Care*. 2005; 43:203–220. [PubMed: 15725977]
- Substance Abuse and Mental Health Services Administration. Working definition of recovery: 10 guiding principles. Rockville, MD: Author; 2012. Retrieved from <http://store.samhsa.gov/shin/content/PEP12-RECDEF/PEP12-RECDEF.pdf>
- Tracy EM, Laudet AB, Min MO, Kim H, Brown S, Jun MK, Singer L. Prospective patterns and correlates of quality of life among women in substance abuse treatment. *Drug and Alcohol Dependence*. 2012; 124:242–249. [PubMed: 22333265]
- Villeneuve PJ, Challacombe L, Strike CJ, Myers T, Fischer B, Shore R, ... Millson PE. Change in health-related quality of life of opiate users in low-threshold methadone programs. *Journal of Substance Use*. 2006; 11:137–149.
- White WL. Addiction recovery: Its definition and conceptual boundaries. *Journal of Substance Abuse Treatment*. 2007; 33:229–241. [PubMed: 17889295]

- White, WL. Recovery/remission from substance use disorders: An analysis of reported outcomes in 415 scientific reports, 1868–2011. Philadelphia, PA: Philadelphia Department of Behavioral Health and Intellectual disAbility Services and Great Lakes Addiction Technology Transfer Center; 2012. Retrieved from http://www.williamwhitepapers.com/pr/__books/full_texts/2012%20Recovery-Remission%20from%20Substance%20Use%20DisordersFinal.pdf
- Witkiewitz K. “Success” following alcohol treatment: Moving beyond abstinence. *Alcoholism: Clinical and Experimental Research*. 2013; 37:E9–E13.

Figure 1. Confirmatory Factor Analysis of latent measure of recovery

Note: All path coefficients are standardized and are statistically significant ($p < .001$); Percent of variance explained is presented in italics. Model fit statistics: Chi-Square (5) = 21.81, $p < .01$, CFI = .98, and RMSEA = .06

Figure 2. Recovery as a predictor of change in health-related quality of life

Note: All path coefficients are standardized and are statistically significant ($p < .001$);

Percent of variance explained is presented in italics. Model fit statistics: Chi-Square (13) =

95.52, $p < .001$, CFI = .96, and RMSEA = .08

Table 1

Descriptive statistics for model measures

VARIABLE	Year 15 (n = 1,008) Mean (SD)	
Physical Health Problems	0.26	(0.29)
Mental Health Problems	0.13	(0.20)
Sobriety	2.47	(4.20)
Satisfaction with Environment and Relationships	4.33	(1.88)
Daily Functioning	49.56	(4.01)
Health-Related Quality of Life (HRQoL) at Year 15	0.76	(0.29)
Health-Related Quality of Life (HRdQoL) at Year 16	0.77	(0.28)

Table 2

Bivariate associations with Year 15 Health-Related Quality of Life (HRQoL)

Measure (variance explained) ^a	β	<i>SE</i>	<i>p</i>
Physical Health Problems (33.7%)	-0.580	0.025	<.001
Mental Health Problems (24.5%)	-0.495	0.040	<.001
Sobriety (1.5%)	0.122	0.002	<.001
Satisfaction with Environment and Relationships (6.2%)	0.249	0.005	<.001
Daily Functioning (33.2%)	0.576	0.002	<.001
Latent Measure of Recovery (60.5%)	0.778	0.026	<.001

^a Per Dennis (1997), we interpret percent of variance as a small (1%), moderate (2%) and large (3.1%) effect.

Table 3

Predicting Year 16 Health-Related Quality of Life (HRQoL)

Model (total variance explained) measure	β	<i>SE</i>	<i>p</i>
Model 1 (41.0%)			
Year 15 Health-Related Quality of Life (HRQoL)	0.556	0.030	<.001
Physical Health Problems	−0.129	0.029	<.001
Model 2 (40.6%)			
Year 15 Health-Related Quality of Life (HRQoL)	0.584	0.028	<.001
Mental Health Problems	−0.096	0.040	<.001
Model 3 (39.8%)			
Year 15 Health-Related Quality of Life (HRQoL)	0.633	0.025	<.001
Sobriety	−0.017	0.002	0.493
Model 4 (39.9%)			
Year 15 Health-Related Quality of Life (HRQoL)	0.638	0.025	<.001
Satisfaction with Environment and Relationships	−0.026	0.004	0.305
Model 5 (40.8%)			
Year 15 Health-Related Quality of Life (HRQoL)	0.567	0.030	<.001
Daily Functioning	0.112	0.002	<.001
Model 6 (42.2%)			
Year 15 Health-Related Quality of Life (HRQoL)	0.441	0.048	<.001
Latent Measure of Recovery	0.245	0.022	<.001