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Recovery among Adolescents: Models for Post-Treatment Gains in Drug Abuse Treatments

George W. Joe, Ed.D., Danica Kalling Knight, Ph.D., Jennifer E. Becan, Ph.D., and Patrick M. Flynn, Ph.D.

Texas Christian University Fort Worth, TX 76129 USA

Abstract

Recovery among adolescents undergoing substance abuse treatment was modeled in terms of pre-treatment motivation, therapeutic relationships, psychological functioning, treatment retention, legal pressures, DSM diagnoses, and client demographics. To address between program differences, a within-covariance matrix, based on 547 youth, was used. Applicability of the results across treatment modalities was also examined. The data were from the NIDA-sponsored DATOS Adolescent study. Results from structural equation models (estimated using Mplus) indicated that higher pre-treatment motivation predicted stronger counselor and in-treatment peer relationships, better counselor relationships and retention predicted less illegal drug use at follow-up, and DSM diagnosis was important in the treatment process. Overall, illegal drug use at follow-up was associated with post-treatment alcohol consumption, cigarette use, condom nonuse, psychological distress, criminality, and school non-attendance. The results document the importance of motivation and therapeutic relationships on recovery, even when taking into account the relative effects of legal pressures, DSM diagnoses, and demographics.

Keywords

Adolescents; Treatment Process; Follow-up Outcomes; Recovery; Motivation; Therapeutic Relationships

1. Introduction

Substance use has become an increasingly serious problem among American youth (Chung & Martin, 2011; Johnston, O'Malley, Bachman, & Schulenberg, 2008; Substance Abuse and Mental Health Services Administration, 2011). In response, new initiatives in creating appropriate and effective interventions for substance use among adolescents have resulted in the development and refinement of numerous treatment approaches that have demonstrated post-treatment differences between treatment and comparison groups and significant changes on key measures from pre- to post-treatment (e.g., Dennis et al., 2004; Henggeler, 2011; Kaminer & Waldron, 2006; Liddle et al., 2001; Macgowan & Engle, 2010; Rowe, 2010). While these studies have identified effective interventions for adolescent drug users,

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Correspondence concerning this article should be addressed to George W. Joe, Ed.D., Institute of Behavioral Research, Texas Christian University, TCU Box 298740, Fort Worth, TX 76129; Telephone: 817-257-7226; FAX: 817-257-7290; g.joe@tcu.edu. More information is available on the internet at www.ibr.tcu.edu.

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they also raise issues around the process of recovery – factors during treatment that contribute to client improvement. The purpose of this study is to explore how key elements of the treatment process – namely motivation, treatment engagement (counselor and in-treatment peer relationships), psychological distress, and retention – together with legal pressures, mental health problems, and demographics impact long-term recovery among youth.

1.1. The recovery process

Recovery from addiction can be conceptualized as a potentially lengthy process involving both the initiation of behavioral change and the maintenance of personal improvement over time. Recovery is viewed as more than the absence of symptoms, and includes responsibility for oneself and others in the community focused on a “voluntarily maintained lifestyle characterized by sobriety, personal health and citizenship” (Betty Ford Institute Consensus Panel, 2007; McLellan, 2010). White and Kelly (2011) describe the recovery process as one that involves long-term recovery rather than short-term abstinence; in essence, one that focuses on incremental and sustained change rather than on the achievement of desired outcomes. While studies of post-treatment outcomes demonstrate the effectiveness of treatment interventions, they invite further investigation into the elements of treatment that led to those changes. The context in which change occurs must be examined, and elements of treatment must be linked to client improvement if the process of recovery (initiation and maintenance) is to be better understood.

Early studies of adults in treatment documented a link between motivation and retention (Simpson & Joe, 1993), the importance of client engagement (e.g., participation, counselor rapport) in promoting client change (Simpson, Joe, Rowan-Szal, & Greener, 1995), and a relationship between time-in-treatment (a measure of retention) and post-treatment follow-up outcomes (Simpson, Joe, Greener, & Rowan-Szal, 2000). When both treatment engagement and time-in-treatment are modeled together, relationship development and active participation leads to longer retention and subsequent positive outcomes (Simpson, 2004; Simpson & Joe, 2004). Similar patterns have been found with adolescent samples. Higher problem recognition (one element of motivation) is associated with stronger counselor relationships (Garner, Godley, & Funk, 2008), and counselor relationships promote during-treatment reductions in substance use (Crits-Christoph et al., 2011) as well as improved outcomes following treatment (Diamond et al., 2006; Garnick et al., 2012). Thus, the critical elements of the recovery process likely involve sufficient retention, motivation for treatment, therapeutic relationships, and psychological functioning.

1.2. Treatment retention

The utility of retention as a measure of treatment dose is based upon the consistent finding that treatment retention is critical to recovery (Drug Strategies, 2005). Among adults, longer retention is associated with reductions in prevalence of cocaine use and illegal activity and increases in full-time employment (Hubbard, Craddock, & Anderson, 2003). Among youth, longer treatment retention is associated with lower drug use and lower arrest rates following treatment (Hser et al., 2001). While youth who complete treatment have better outcomes (Williams, Chang, & Addiction Centre Adolescent Research Group, 2000; Winters, 1999), risk of early dropout is high (Gogel, Cavaleri, Gardin, & Wisdom, 2011). Studies examining factors associated with early dropout among adolescents include severity of drug use, family drug involvement, and criminal involvement (Galaif, Hser, Grella, & Joshi, 2001).

1.3. Motivation for treatment

Motivation is a complex and dynamic phenomena that encompasses various constructs such as recognition of a problem requiring help, a desire for help, and a state of readiness to

accept that help (DiClemente & Prochaska, 1998; Simpson, 2004). Furthermore, motivation can be broken down into internal and external components (Ryan, Plant, & O'Malley, 1995). Internal motivation refers to a personal desire to change, whereas external motivation refers to pressures or contracts dictating change (e.g., referral from the legal system). In general, research with adults has shown intrinsic motivators to be better predictors of both retention (Joe, Simpson, & Broome, 1998) and post-treatment outcomes (e.g., Cunningham, Sobell, Sobell, & Gaskin, 1994; Curry, Wagner, & Grothaus, 1990; Deci & Ryan, 1985; Ryan et al., 1995). Similarly, research with adolescents suggests that intrinsic motivation impacts initial and sustained change over time, whereas external pressure from the legal system appears to have little effect on outcomes (Breda & Heflinger, 2007). External motivation can hamper internal motivation, as evidenced by the negative relationship found by Broome, Joe, & Simpson, (2001) between legal involvement and treatment readiness. Thus, examining external and internal motivation simultaneously in recovery process models is important.

1.4. Therapeutic relationships

Given that clients who develop constructive and supportive relationships during treatment have better post-treatment outcomes (Gifford, Ritscher, McKellar, & Moos, 2006), it is important to consider therapeutic relationships when attempting to understand the process of recovery. In adults, counselor rapport serves a pivotal role in the treatment process (see Simpson, 2004, Simpson & Joe, 2004). Recent studies suggest it is significant for adolescents as well. Youth with stronger counselor relationships (i.e., therapeutic alliances) have better short-term (Tetzlaff et al., 2005) and long-term outcomes (Diamond et al., 2006; Garnick et al., 2012; Rogers, Lubman, & Allen, 2008). Findings regarding association with deviant peers are mixed. While affiliation with friends that use drugs can be associated with higher readiness for change at treatment entry (Broome et al., 2001) and the latter to better therapeutic alliances during treatment (Garner et al., 2008), when deviant peer associations continue after treatment, higher relapse rates are reported (Broome, Simpson, & Joe, 2002).

1.5. Psychological functioning

Considering the emphasis placed on patient cognitive changes in individual and group counseling, the importance of improved psychological functioning during treatment would be considered an integral aspect of early recovery (Simpson, 2004). As noted by in the literature (Simpson & Joe, 2004; Simpson et al., 1995), there is evidence that positive change on psychological functioning among adults does occur during treatment and that it is related to therapeutic engagement. Additionally, improved cognitive functioning has been shown to mediate changes in improvement in psychological functioning (Bell, Richard, & Dayton, 1996). In that study, indicators of cognitive functioning included measures of decision making, risk-taking, and social conformity while psychological functioning was measured by self esteem and measures of emotional well-being (anxiety, depression, and hostility). Thus changes in psychological functioning should be examined in important for the recovery process among adolescents as well.

1.6. The current study

Most studies examining the recovery process among adolescents focus on either the front end of treatment (i.e., identifying predictors of retention/therapeutic relationships) or the back end (i.e., examining therapeutic relationships as predictors of outcomes). For example, an early study from the NIDA-funded Drug Abuse Treatment Outcome Studies for Adolescents (DATOS-A) examined relationships among client background, treatment readiness, and therapeutic involvement in three modalities and found that higher treatment readiness was related to higher involvement (Broome et al., 2001). However, the study did not extend the model to post-treatment outcomes. Others have focused on establishing the importance of therapeutic alliance in promoting outcomes, particularly as a predictor of

lower cannabis use at 3- and 6-months post-treatment (Diamond et al., 2006), or have generally studied various treatment elements important in recovery with adolescent populations (e.g., Battjes, Gordon, O'Grady, & Kinlock, 2004; Garner et al., 2009; Handelsman, Stein, & Grella, 2005; Hser et al., 2001). Few have attempted to simultaneously model the longitudinal process from treatment entry to follow-up. Two noteworthy exceptions include one study examining demographic variables as moderators of the relationship between therapeutic alliance and follow-up outcomes (Garnick et al., 2012) and another examining therapeutic alliance as a mediator of the relationship between comorbidity and improved depressive symptoms (Rogers et al., 2008).

The purpose of the current study is to examine outcomes in selected post-treatment measures (i.e., use of illegal drugs, alcohol, cigarettes, condoms, psychological distress, school status, and criminal involvement) within the context of a recovery process framework, focusing specifically on roles of pre-treatment motivation, early indicators of therapeutic relationships, and treatment retention among adolescents who had been treated in three treatment modalities (long-term residential, short-term inpatient, and outpatient drug-free). In addition, the effects of legal pressure and DSM diagnosis on outcomes are examined in conjunction with these key measures. The present study extends the research done previously on this community-based adolescent treatment sample (Broome et al., 2001; Farabee, Shen, Hser, Grella, & Anglin, 2001; Galaif et al., 2001; Hser et al., 2001) and integrates it more closely with the work modeling treatment outcomes in adult populations (Simpson, 2004).

2. Method

2.1. Sample

The NIDA-funded Drug Abuse Treatment Outcome Studies for Adolescents (DATOS-A; Kristiansen & Hubbard, 2001) surveyed 1,785 adolescents from 36 programs in three treatment modalities who were admitted to treatment between November of 1993 through November of 1995. The baseline sample (treatment intake) included 727 clients from 13 long-term residential programs (LTR; Ns: 13, 17, 20, 22, 35, 38, 41, 54, 69, 91, 98, 99, 130), 613 from 9 short-term inpatient programs (STI; Ns: 5, 8, 24, 48, 51, 58, 88, 124, 207), and 445 from 14 outpatient drug-free programs (ODF; Ns: 4, 5, 8, 17, 19, 21, 24, 24, 24, 34, 40, 48, 49, 128). However, taking into account those who had complete data on intake and follow-up measures and the deletion of programs with fewer than 13 clients, a sample of 1287 was available for analysis. Overall, in the total sample of 1785, 69.5% had a 1-month in-treatment interview (LTR – 80.6%, STI – 59.7%, ODF – 64.7%).

Other studies conducted on the DATOS-A samples (which had used 1732 of the 1785 as their base sample), reported that 66% of clients were successfully followed-up the year after termination (Kristiansen & Hubbard, 2001). As noted by Hser and colleagues, a high attrition rate in the follow-up study is not unusual for large-scale field studies of this type (Hser et al., 2001). The field research team attributed the attrition to logistical and resource constraints. When comparing the subjects with and without follow-up interviews, they did not find any differences in age, use of drugs (e.g., marijuana, alcohol, cocaine, other illicit drugs), or enrollment in school. However, the follow-up sample did have a higher percentage of females (about 10% more) and whites (about 6% more).

Because of the possibility of between treatment program differences, a within-covariance matrix was computed from the programs with complete data on the variables modeled in the present study. This procedure however led to a large reduction in sample size ($n = 740$). Of the 740 deletions, 674 were excluded because of missing during treatment data and 66 had been excluded because of small program sample size. The within-covariance matrix was

based on the remaining 547 adolescents who had complete data on the variables used in the modeling (275 in 12 LTR programs, 174 in 5 STI programs, and 98 in 10 ODF programs). Using Mplus, a common model was analyzed to determine its appropriateness in two samples: the within-covariance matrix sample (N= 547), and the sample with complete data on intake and outcome measures (N= 1287). The characteristics and measures of all variables across samples are presented in Table 1. This table reports on the analysis samples and allows for a comparison of the during-treatment missing data sample to the sample with complete data. Minimal differences are documented.

For the study sample of 1287, 71% were male (LTR, 80%; STI, 65%; ODF, 63%); 20% were African American (LTR, 27%; STI, 9%; ODF, 22%), 57% White (LTR, 42%; STI, 76%; ODF, 57%), and 18% Hispanic (LTR, 27%; STI, 8%; ODF, 17%). The average age was 15.8 years (*s.d.* = 1.3; LTR, 15.9 years; STI, 15.8 years; ODF, 15.5 years); with 75% between the ages of 15 and 17. Thirty-one percent were heavy alcohol users (5 or more drinks in a single setting at least once per week) in the year prior to treatment (LTR, 32%; STI, 37%; ODF, 21%). The most commonly reported illegal drug was marijuana [84% were at least weekly users (LTR, 87%; STI, 84%; ODF, 76%) and 55% were daily users (LTR, 61%; STI, 57%; ODF, 38%)]. With respect to use of any illegal drug, 87% were classified as at least weekly users (LTR, 90%; STI, 88%; ODF, 78%) and 61% daily users (LTR, 67%; STI, 63%; ODF, 44%). Over a quarter (27%) reported using a “hard drug” (cocaine, heroin, other opiates, downers, uppers, hallucinogens) on a weekly basis (LTR, 31%; STI, 29%; ODF, 15%). About 55% reported having been arrested for a non-traffic violation in the year prior to intake (LTR, 74%; STI, 45%; ODF, 33%). For lifetime arrests, about 24% reported having been arrested 7 or more times (LTR, 38%; STI, 16%; ODF, 10%).

Overall, 61% of all adolescents in the 1287 sample were classified as having a DSM diagnosis. Of the adolescents with a DSM disorder (61%), 92% of them were classified as having a conduct disorder, followed by ADHD (12%) and depression (12%). Very few were classified as having either panic disorder (1.6%) or over anxious disorder (1.6%). The percentages of any diagnosis were higher for STI (67%) and LTR (62%) and lower for ODF (51%). On the most prevalent diagnosis (Conduct Disorder), the percentages were 62% for STI, 60% for LTR, and 41% for ODF.

2.2. Treatment programs

Adolescent clients were from three treatment modalities: 13 long-term residential treatment programs (LTR), of which 8 had 30 or more clients; 9 short-term inpatient programs (STI), of which 5 had at least 30 clients; and 14 outpatient drug-free programs (ODF), of which 3 had at least 30 clients. The residential treatment programs included traditional, modified, and short-term therapeutic communities. They provided residential living, education and counseling sessions, and interventions to re-socialize youth. One program originally included in Kristiansen and Hubbard (2001) was omitted from the analyses due to a small sample (*n*=2) and missing data on key measures. The outpatient drug-free programs included regular and intensive day treatments. Services in these outpatient treatments included group and individual counseling sessions, family therapy, education, and skills training. Treatment tenure was a discriminating factor between the three treatment modalities. The median tenure for LTR was 121 days compared to 70 days for ODF and 22 days for STI. Approximately 64% of those in long-term residential remained in treatment for 90 days or longer compared to 45% for outpatient drug free. In STI, 28% of the clients stayed at least 30 days.

2.3. Measures

The variables used in the analyses are described below and their means, standard deviations, and proportions are provided in Table 1. Measures were collected at intake, during treatment (1-month following intake), and post-treatment (12 months following treatment).

2.3.1. Intake Measures—Items from the DATOS-A Intake 2 interview assessment instrument (Flynn, Craddock, Hubbard, Anderson, & Etheridge, 1997) measuring Problem Recognition (PR), Desire for Help (DH), and Treatment Readiness (TR), which corresponded to stages of therapeutic readiness (Simpson & Joe, 1993), were used as indicators of motivation for treatment. These three scales were confirmed originally in an adult sample (Joe et al., 1998), which involved a previous psychometric analysis of a 20-item subset from the Circumstances, Motivation, Readiness, and Suitability components scale (CMRS; De Leon & Jainchill, 1986). PR assesses personal acknowledgement of behavioral problems resulting from drug use, DH assesses awareness of an intrinsic need for change, while TR measures commitment to active change through participation in drug treatment. Each of these scales ranged from 10 to 50 and was found to have satisfactory reliabilities (PR-alpha, .71; DH-alpha, .81; TR-alpha, .71). Previous confirmatory factor analyses found each to have satisfactory fits as measured by the root mean square error of approximation (RMSEA) in adult LTR (RMSEA = .070) and ODF (RMSEA = .075) treatment samples (Joe et al., 1998). These motivation measures are used as indicators of a latent construct for motivation.

The measure of legal pressure for treatment, an indicator of external motivation, was from the DATOS-A Intake 2 interview assessment and derived from the question “Was your admission to this program actually required or suggested by the criminal (juvenile) justice system?” Response options were 1 = “Yes” or 0 = “No.” Diagnoses of Attention Deficit Hyperactivity Disorder (ADHD), Conduct Disorder, Depression, Over Anxious Disorder, or Panic Disorder were derived from administrations of the Diagnostic Interview Schedule for Children – Revised (DISC-R). A diagnosis of one or more of these disorders was used to indicate a DSM-III-R diagnosis. Drug related diagnoses were not included in the scoring.

A composite measure representing frequency of all illegal drug use, including marijuana, cocaine, heroin, other opiates, downers, uppers, hallucinogens, and inhalants was created. Drug usage was measured using a 9-point scale (where 0 = none, 1 = less than once a month, 2 = 1-3 times a month, 3 = 1-2 times a week, 4 = 3-4 times a week, 5 = 5-6 times a week, 6 = daily, 7 = 2-3 times a day, 8 = over 3 times a day). This composite mapped the frequency reported for each drug into a single response scale using a scheme based on combining the maximum drug frequency for any of the 8 drug groups and the averaged drug score obtained by averaging frequencies across all 8 drug groups. The possible scores for the composite measure range from 0 (no use) to 8 (more than 3 times a day). This procedure was patterned after that used for a measure of total drug frequency combining multiple drugs (Joe & Simpson, 1993; Joe, Flynn, Broome, & Simpson, 2007). The composite measure was computed for drug use reported at treatment intake and at the 12-month follow-up. With the exception of marijuana, the other drugs in this composite were considered “hard drugs.” Number of arrests was defined as the number of arrests in the 12 months prior to intake and across the lifetime.

2.3.2. During-treatment measures—Four measures addressing treatment experience after 1-month in treatment were used as indicators of the counselor relationship latent variable. Clients were asked to rate (1) how well the primary treatment provider understands them, (2) the relationship with the primary treatment provider, (3) the degree to which sessions helped in stopping or reducing drug use, and (4) the degree to which the sessions

helped with other client problems. In-treatment peer relationships used two indicator variables that asked (1) how well the client feels members of the “regular treatment group” understand them and (2) how the client would rate their relationship with this group. Therapeutic relationship measures were available for only a subset of the follow-up sample (those staying long enough to complete the month 1 in-treatment questionnaire). For the analysis sample ($N = 1287$), 84.7% of LTR, 67.4% of STI, and 72.3% of the ODF samples had this information.

Psychological functioning at month 1 was addressed using a measure of psychological distress. Psychological distress ($\alpha = .66$) is a 8-item scale addressing anxiety symptoms, depression symptoms, suicidal ideation, suicide attempts, trouble controlling temper or violent behavior, suspicion of other people, hallucinations, and mental troubles (trouble understanding, concentrating, or remembering). Each item was answered “yes” or “no” (range = 0 – 8) in reference to the past month. These items have been frequently used in intake assessments such as the Addiction Severity Index (ASI; McLellan, Luborsky, Woody, & O'Brien, 1980) for measuring mental health status.

Time-in-treatment (as a measure of treatment retention) represented the number of days from intake to discharge. However, in the current analyses, the measure was capped at 360 days for adolescents treated in LTR and ODF, and at 60 days for adolescents who were treated in STI. Previous research has shown that being in treatment for at least 90 days in LTR and ODF was a minimum threshold related to improved outcomes for participants in those modalities, with even better outcomes as retention increases beyond 90 days (Condelli & Hubbard, 1994; Gossop, Marsden, Stewart, & Rolfe, 1999; Simpson, 1979, 1981).

2.3.3. Follow-up measures—Of the post-treatment measures, primary follow-up measure is a report of illegal drug use at 12-months follow-up, which is identical to that described earlier under intake measures. In addition to an overall measure of illegal drug use, other drug use measures included marijuana use, heavy alcohol use (5 or more drinks in a single sitting at least once per week), and cigarette use (0 = no use, 1 = 1-5 per day, 2 = 6-15, 3 = 16-25, 4 = 26-35, 5 = Over 35 per day). Marijuana use and heavy alcohol use were reported at intake and 12-month follow-up, with cigarette use reported at 12-month follow-up only. The reasons for including these were based on their relevance for adolescents. Marijuana and alcohol use are the two drugs most frequently used by adolescents (Johnston, O'Malley, Bachman, & Schulenberg, 2013). Marijuana use at intake was assessed by a question that asked frequency in the 12 months before admission to this program and at the 12-month follow-up it was assessed by the same question asking frequency of use in the past year. Heavy alcohol use in the 12 months prior to intake and the 12 months prior to the follow-up were defined by the criterion used by Hser and colleagues (2001).

An important area addressed in the 12-month follow-up interviews concerned risky sexual behaviors. A series of questions inquired about different types of sexual intercourse and the use of condoms in those situations. Each question used a 4-point response scale (1 = never, 2 = sometimes, 3 = usually, 4 = every time). Three follow-up measures were used as indicators in a latent variable denoting condom use during the 12-month follow-up period: (1) *vaginal* condom use, (2) *anal* condom use, and (3) *oral* condom use.

Psychological functioning, in reference to the past 12 months, was addressed at the 12-month follow-up using a measure of psychological distress comparable to that used at 1-month in treatment. The School variable was based on a question that asked whether the adolescent had been enrolled in any school, college, or educational/training program in the past 12 months. If the respondent indicated yes, then a score of one was given; otherwise, a score of zero was given. Criminality was addressed in terms of two variables: arrests and

illegal activities. Arrests was defined as the number of arrests in the past 12 months; illegal activity was taken from a question that asked whether there had been “involvement in illegal or criminal activity in order to get money for drugs” (0 = no, 1 = yes).

2.4. Analysis plan

The effects of pre-treatment motivation, legal pressures, DSM diagnoses, treatment engagement, psychological distress and treatment retention on selected post-treatment drug use and other concurrent post-treatment measures were estimated across the three modalities through structural equation modeling using Mplus (Muthén & Muthén, 2007). A feature of this software is that it can accommodate missing data. In interpreting the fit of the model to the data, the goodness-of-fit chi-square, the root mean square residual (RMSEA), the standardized root mean square residual (SRMR) the comparative fit index (CFI), and the Tucker-Lewis index (TLI) are reported. For chi-square, RMSEA, and SRMR, smaller values indicate better fits. Because the chi-square test of model fit may be sensitive to sample sizes larger than 200, a significant chi-square may not be a satisfactory indicator of the model fit. As noted in Schumacker and Lomax (2004), if the normed chi-square (computed as chi-square divided by its degrees of freedom) is less than 3.84, then this may be a better indicator of the data fitting the model. RMSEA values of .01, .05, and .08 indicate excellent, good, and mediocre fit respectively (MacCallum, Browne, & Sugawara, 1996). For SRMR, a value less than .08 is considered a good fit (Hu & Bentler, 1998). The CFI ranges from 0 to 1; values above 0.9 indicate reasonable fit. For TLI, values of .90 or greater are considered at least marginally satisfactory. Because of the small sample sizes for many of the programs in the research study, a multi-level estimation of the model could not be done; instead, the common model was tested using the within-covariance matrix for the total sample.

The relationships of principal interest are presented in Figure 1. Selection of which pathways to model was informed by prior research on the role of therapeutic relationships in promoting sustained change following treatment. Thus, motivation is conceptualized as having an indirect effect on retention and other outcomes principally through relationship measures. Following research on the treatment process (Simpson, 2004), another possible intervening variable is psychological functioning, which is represented by psychological distress in the figure. Intake illegal drug use is included as a covariate because the primary outcome is illegal drug use at follow-up. The pivotal elements include (a) therapeutic relationships (counselor and in-treatment peers), (b) during treatment psychological functioning, and (c) treatment retention as predictors of 12 month follow-up outcomes in a base model (predicting illegal drug use at 12 months) and in a series of expanded models (predicting other outcomes at 12 months – cigarette use, condom use, etc.). Latent variables included pre-treatment motivation, counselor relationship, and in-treatment peer relationships. For each of the other follow-up outcomes, all of the paths in the illegal drug use model were included, plus covariance was estimated between follow-up illegal drug use and each follow-up outcome.

3. Results

The principal results are those based on the within-covariance matrix ($n = 547$) across modalities as this minimizes the between program differences. Following these results, additional analyses are presented based on samples that include all individuals for whom data was available ($n = 1287$). These results are reported to demonstrate the applicability of the major paths in the model under the constraints of the other data.

3.1. Across modality models from common within-covariance matrix

3.1.1. Illegal drug use: Base model—The common covariance matrix based on the sample of 547 adolescents was used for estimating the model predicting illegal drug use at 12-months following treatment termination that is described in Figure 1. From the goodness-of-fit measures [χ^2 (107) = 396.55, normed χ^2 = 3.71, CFI = .85, TLI = .81, RMSEA = .070 (.063, .078), SRMR = .065], the fit was judged to be marginal. The RMSEA was closer to .08 than to .05, and the other indices suggested that some modification of the model might be useful. In keeping with the intention of testing the hypothesized paths (structural part of the model), measurement components of the model were examined for possible changes. Within the motivation latent variable, the problem recognition (PR) scale had a lower loading than the other two scales (desire for help and treatment readiness) and by definition did not represent “wanting help for drug use” (as the other two did). Therefore, PR was dropped, and the analyses were redone with the motivation latent variable comprising only DH and TR. The resulting estimated model had better goodness-of-fit measures [χ^2 (91) = 282.63, normed χ^2 = 3.11, CFI = .88, TLI = .83, RMSEA = .062 (.054, .070), SRMR = .062]. An inspection of the modification indices of this analysis suggested that correlating the measurement errors for two indicators of the counselor relationship latent variable would improve the fit greatly (52.32 reduction in χ^2). This modification was employed, and these measurement modifications were carried forward in each analysis of the other outcomes.

The results for 12-month follow-up illegal drug use (base model) for adolescents are presented in Figure 2. The model was found to fit the data, and basic paths were mostly supported: (1) motivation to therapeutic relationship {counselor [b = .41 (.05), t = 8.82, p < .0001]; in-treatment peers [b = .33 (.05), t = 6.40, p < .0001]}, (2) therapeutic relationship to psychological distress during treatment {in-treatment peers [b = -.23 (.05), t = -4.67, p < .0001]}, (3) therapeutic relationship to follow-up drug use {counselor [b = -.13 (.05), t = -2.73, p < .006]}, and (3) treatment retention to follow-up drug use [b = -.13 (.04), t = -3.09, p < .002]. Other significant path estimates included illegal drug use at intake to illegal drug use at 12 month follow-up [b = .09 (.04), t = 2.16, p < .04]. Legal pressures were found to have a negative effect on internal motivation for treatment [b = -.12 (.05), t = -2.64, p < .008]. Having a non-drug DSM Diagnosis was positively related to both counselor relationship [b = .11 (.05), t = 2.55, p < .02] and to psychological distress at month 1 [b = .14 (.04), t = 3.40, p < .001]. One path that was not supported was therapeutic relationship to treatment retention. In this sample, neither counselor relationships nor in-treatment peer relationships were significantly related to retention.

3.1.2. Other follow-up outcomes: Expanded model—Following confirmation of the base model as an appropriate framework for examining key relationships, the model was extended to include other 12-month post-treatment outcomes. In the results below, only the estimated paths to those outcomes, other than illegal drug use, are reported (see Table 2).

3.1.3. Other drug use—Three drugs were selected for additional examination: marijuana, heavy alcohol use, and cigarettes. Each of these models had satisfactory fit indices. Both counselor relationship and retention had significant negative paths to marijuana use (signifying the importance of treatment on this outcome), but neither of these two predictors had significant effects on heavy alcohol consumption or cigarette use. DSM diagnosis was a significant positive predictor for cigarette use. Of the exogenous variables (not predicted by other variables), the results suggested only a few relationships. While marijuana and alcohol use at intake were significant predictors of those same substances at follow-up, illegal drug use at intake was not a predictor of cigarette use at follow-up. White adolescents were more likely to use cigarettes more frequently at follow-up than non-Whites, and males were more

likely to use marijuana at follow-up than were females. Illegal drug use at follow-up was significantly and positively related to both heavy alcohol and cigarette use at follow-up.

3.1.4. Condom usage—The RMSEA model fit index for the analysis of condom use at follow-up showed satisfactory fit for the condom use outcome. Those who stayed longer in treatment were more likely to use condoms. Older adolescents and White adolescents were less likely to use condoms at follow-up. Moreover, condom use was significantly and negatively correlated with overall illegal drug use at follow-up; that is, greater overall drug use was related to less condom use in possible HIV-risk situations in the year prior to the follow-up interview.

3.1.5. Psychological distress—Both the RMSEA and SRMR model fit indices for the analyses of psychological distress at follow-up indicated satisfactory fit. Psychological distress during treatment was the strongest predictor of psychological functioning at follow-up. Females were more likely than males to report psychological distress. With respect to overall illegal drug use at follow-up, the results were consistent in showing that more illegal drug use was related to more psychological distress at follow-up.

3.1.6. School—The results for school also show a satisfactory fit. Findings suggest that a better counselor relationship and being White were related to having been in school during the 12-months following treatment. However, older adolescents were less likely to be attending school, and less post-treatment illegal drug use was related positively with being in school.

3.1.7. Criminality—The RMSEA model fit indices for criminality indicated satisfactory fit for both criminality measures. Having a better counselor relationship was a factor in limiting post-treatment arrests and illegal activities. Non-whites and those with better in-treatment peer relationships tended to report more arrests. Males and those who reported more illegal drug use at intake were more likely to be engaging in illegal activity at follow-up. As expected, both indicators of post-treatment criminality were significantly and positively related to post-treatment illegal drug use.

3.2. Secondary Analyses: Modality Specific Models

The analyses in the previous section provided a detailed examination of the recovery process across treatment modality, while controlling for program and modality differences using a within-covariance matrix. Although appropriate, this conservative analytic technique greatly reduced the sample size, therefore prohibiting exploration of between modality differences in the recovery process. As a secondary focus of this study, the following section considers the possibility of exploring modality specific differences.

3.2.1 Comparison of common model to multiple groups within-covariance matrices—The first step in exploring variation in the recovery process by modality was to compare the common covariance model across treatment modalities to modality-specific models. A separate within-covariance matrix was computed for each of the three treatment modalities and these were used together in a multiple-groups analysis in which the parameters were allowed to be estimated freely. The fit-statistics suggested a reasonably “good fit” [χ^2 (280) = 442.221, normed χ^2 = 1.58, CFI = .90, TLI = .87, RMSEA = .056 (.046, .066), SRMR = .072]. The chi-square contribution by treatment modality was 160.313 for LTR, 144.015 for STI, and 137.892 for ODF. A comparison was made between these results and a model where the paths were constrained to be equal across modality [χ^2 (324) = 509.864, normed χ^2 = 1.57, CFI = .88, TLI = .87, RMSEA = .056 (.047, .065), SRMR = .022]. The chi-square difference statistic [χ^2 (44) = 67.643, p < .02, normed χ^2 = 1.54] was

significant, although the normed chi-square was small (below 2). When the multiple groups statistics were compared with the result from the analysis based on the common within-covariance matrix ($N = 547$), the chi-square difference [$\chi^2(190) = 207.423, p < .19$, normed $\chi^2 = 1.09$] was not significant. These two comparisons suggest that the assumption of a common covariance matrix among the modalities was a viable one.

Although the common model showed a better fit than the model allowing modality specific differences, further inspection of the path coefficients suggested that there might be differences among the modalities. However, because the sample sizes were small for clients with complete intake, during-treatment, and post-treatment measures ($LTR = 273$, $STI = 173$, and $ODF = 97$), there was concern regarding statistical power issues for additional analyses exploring between modality differences, especially for ODF. This issue is addressed in analyses presented below in which missing data was allowed in the estimations.

3.2.2. Comparison of common model to multiple groups matrices based on non-missing intake and follow-up sample—The same comparison as performed in the previous section between the common and modality specific models was performed on the larger sample of 1287 adolescents who had complete intake and follow-up data, but allowing missing data on during-treatment measures (554 in LTR, 448 in STI, and 285 in ODF; see Figure 3). The first analysis was a multiple groups model with the parameters allowed to be estimated without constraints in each of the treatment modalities. The fit statistics suggested a “good fit” [$\chi^2(290) = 615.400$, normed $\chi^2 = 2.12$, CFI = .88, TLI = .85, RMSEA = .051 (.046, .057), SRMR = .076]. The contributions to the chi-square by modality were 262.583 for LTR, 190.881 for STI, and 161.937 for ODF. A second model was fitted with the paths in the model constrained to be equal among the modalities. Its fit statistics [$\chi^2(334) = 705.770$, normed $\chi^2 = 2.11$, CFI = .87, TLI = .86, RMSEA = .051 (.046, .056), SRMR = .081] were very similar to those for the free model. The contributions to the chi-square by modality were 305.516 for LTR, 206.706 for STI, and 193.547 for ODF. The chi-square difference test for the two models was significant [$\chi^2(44) = 90.37, p < .0001$, normed $\chi^2 = 2.05$]. The largest contribution was LTR, which suggests that its model may be more dissimilar to the other two modalities. This was borne out when the modalities were compared pairwise. For LTR versus STI [$\chi^2(22) = 53.017, p < .0002$, normed $\chi^2 = 2.41$], the chi-square difference was significant. Similarly, the comparison of LTR versus ODF [$\chi^2(22) = 42.177, p < .006$, normed $\chi^2 = 1.92$] was also significant. However, the difference between STI and ODF [$\chi^2(22) = 29.832, p < .12$, normed $\chi^2 = 1.36$] was not significant, and its normed chi-square was much smaller among these pairwise comparisons.

Based on the results above, a simple model was fitted for the 1287 patients from the three treatment modalities. Its fit statistics [$\chi^2(90) = 447.544$, normed $\chi^2 = 4.97$, CFI = .88, TLI = .84, RMSEA = .056 (.050, .061), SRMR = .069] were somewhat similar to the multiple groups results, with the exception that the normed chi-square was worse. When compared to the results of the within-groups covariance matrix of 547 adolescents [$\chi^2(90) = 227.685$, normed $\chi^2 = 2.53$, CFI = .91, TLI = .88, RMSEA = .053 (.045, .062), SRMR = .060], the fit statistics were also worse. Although the fitted model for the 1287 sample was generally reasonable, it does suggest that using the within-covariance matrix mitigated some of the between-modality and between-treatment facility differences.

4. Discussion

4.1. General summary of findings

Results of the present study suggest that events occurring within the first month of treatment are critically important for recovery among adolescents. Motivation for treatment plays a key role in developing stronger counselor and peer relationships, and therapeutic

relationships (namely with counselors) may serve a pivotal role in promoting better post-treatment outcomes, including overall illegal drug use, marijuana use, school attendance, and arrests. The effect of counselor relationship remained significant within the context of competing potential influences on the follow-up outcome, including pre-treatment overall illegal drug use, DSM diagnosis (e.g., Grella, Joshi, & Hser, 2004; Rogers et al., 2008), perceived legal pressure (e.g., Farabee et al., 2001; Galaif et al., 2001), and demographics (gender, age, and race-ethnicity, Garnick et al., 2012). Furthermore, those staying longer in treatment had less illegal drug use and marijuana use at follow-up. Longer treatment retention was also positively related to more condom use in risky sex situations. Secondary analyses suggest there may be variation due to modality. However, because the analyses using the within-covariance matrix were limited in sample size, modality specific differences could not be fully explored within the current study.

4.2. Factors important in adolescent recovery

Modeling of overall adolescent illegal drug use, in the current study, including the significant process relationships (motivation predicting early therapeutic relationships which then predict illegal drug use at follow-up), were similar to the core of the TCU Treatment Process Model which was developed among adult populations in methadone maintenance treatment (Simpson, 2004). Findings also corroborate prior work with adolescents demonstrating links between pre-treatment motivation and therapeutic alliance (Garner, Godley, & Funk, 2008) and between therapeutic alliance and post-treatment outcomes (Diamond et al., 2006; Garnick et al., 2012; Rogers et al., 2008; Tetzlaff et al., 2005). While there were similarities between the treatment process for adults and the present findings for adolescents, particularly with regard to the importance of the counselor relationships, the role of retention was less clear for adolescents.

Treatment retention was not the consistent predictor of post-treatment outcomes among adolescents as it has been previously shown to be among adults (e.g., Simpson & Joe, 2004; Simpson, Joe, & Rowan-Szal, 1997). It was however a predictor of overall illegal drug use, lower marijuana use, and condom use. These mixed results for retention are somewhat in agreement with the findings reported previously (Galaif et al., 2001; Hser et al., 2001). Hser and colleagues found longer retention to be related to the absence of marijuana use, drug or alcohol use, and arrests when the data were combined across modalities, while Galaif and colleagues found retention not to be related to marijuana, alcohol, criminal involvement, or psychological maladjustment in separate analyses of long-term residential and outpatient drug-free clients. As these authors conjectured, their lack of results for retention may have been due in part to the fact that retention was treated as a continuous variable rather than as a threshold for having stayed in treatment for a critical period of time.

The lack of statistically significant associations between retention and other measures could also be attributed to measurement limitations. STI generally does not exceed 28 days, limiting variability and predictive power. Furthermore, the definition and documentation of retention is not necessarily equivalent in residential and outpatient settings. Retention is derived from the number of days between admission and discharge; however in outpatient, discharge can be difficult to define as clients may simply choose to stop attending sessions. Therefore in outpatient settings it is helpful to consider both retention (number of days in treatment) and exposure (number of sessions; Hoffman et al., 1994).

Another factor that may have led to differences with findings from adult samples is the time at which the engagement variables were measured. In the current study, the brevity and varying lengths of the treatment episode (long-term residential averaged 152.2 days; short-term inpatient averaged 26.5 days, and outpatient drug-free averaged 108.6 days) required the measurement of engagement to be early in treatment. This change may have contributed

to differences with adult studies (e.g., Etheridge, Hubbard, Anderson, Craddock, & Flynn, 1997; where residential averaged 213 days, short-term inpatient averaged 21 days, and outpatient drug-free averaged 90 days). These shorter tenures necessitated use of earlier indicators of treatment engagement for adolescents (1-month) than had been used for adults (3-months).

Interestingly, the in-treatment peer relationships measure did not have direct effects on substance use outcomes. The lack of findings regarding in-treatment peer relationships may be due to the early timing (1-month in treatment) at which this treatment indicator was measured. Positive peer relationships may take more time to develop, particularly in outpatient settings where opportunities for peer interaction are limited. Future studies should also take into consideration the role of peers outside treatment, because support from peers outside treatment can be more important in facilitating retention than support from peers in treatment (Edelen et al., 2007).

DSM-diagnosis was found to be a significant predictor of psychological distress during treatment, further documenting its significance as a factor in adolescent recovery from substance abuse. It was related to more cigarette use and indirectly to psychological distress at follow-up through its effects on psychological distress during treatment. It was related positively to counselor relationship during treatment, which extends the findings previously found by Rogers (Rogers et al., 2008). This extends the prior research on adolescents in community-based treatment (Farabee et al., 2001; Galaif et al., 2001; Hser et al., 2001) and integrates it more closely with the work modeling treatment outcomes in adult populations (e.g., Battjes et al., 2004; Garner et al., 2009; Handelsman et al., 2005; Hser et al., 2001; Simpson & Joe, 2004; Simpson et al., 2000). Differences in findings may be due in part to the use of broad measures of DSM diagnosis and psychological distress rather than specific diagnoses or symptomology (i.e., conduct disorder, depression).

Pre-treatment external motivation, (i.e. pressure from juvenile justice), did not have direct effects on the outcomes investigated or on retention. However, it did have a negative effect on intrinsic motivation for treatment, thereby impacting the recovery process indirectly. This finding is consistent with a previous study on the relationship between legal status and treatment readiness (Broome et al., 2001). Thus, while external pressure from justice sources can serve to encourage treatment enrollment, intentional efforts to increase motivation among youth mandated to treatment may be needed to better facilitate treatment engagement and behavioral change (Feldstein & Ginsburg, 2006; Stein, Colby, Barnett, Monti, & Golembeske, 2006).

4.3. Limitations

While the current study employed a national sample of youth in long-term residential, short-term inpatient, and outpatient drug-free treatment programs, several limitations should be noted. First, the study relied on self-reported measures of substance use and behavioral outcomes. While research suggests that validity is generally high (Johnson et al., 2000; Secades-Villa & Fernandez-Hermida, 2003), others report discordance, observing both false positives and false negatives (Buchan, Dennis, Tims, & Diamond, 2002). Future studies should include objective markers in follow-up designs to insure the validity of self-reported use (Whitford, Widner, Mellick, & Elkins, 2009). Second, future research should consider assessing relationships and psychosocial functioning at later points in treatment in order to more closely compare models of adolescent recovery to those with adults. Third, it is likely that the engagement measures may be more meaningful for clients in residential than in outpatient settings because of the greater number of therapeutic contact hours and the incorporation of peers or “community” in residential treatment. Fourth, future research might incorporate motivation for staying clean or maintaining positive change into the

analytical models so that the role of motivation can be examined in terms of ongoing recovery and the transition out of treatment.

Other limitations include issues related to attrition, missing data, and the age of the dataset. Early dropout affects the availability of during-treatment measures, and the 66% follow-up rate affects availability of follow-up measures. Although these limitations are inherent in all longitudinal research conducted in applied settings, missing data is necessarily a concern. However, based on the similarity of results comparing models predicting illegal drug use with (1) the adolescent sample allowing for missing data during-treatment and (2) the present study sample, the effect that missing data might have on relationships between motivation, treatment process, and follow-up outcomes appear minimal. A larger sample with complete data would allow for examination of between modality differences while controlling for program variation using within-covariance matrices. Finally, although these data are older, DATOS-A represents a rare comprehensive dataset and includes most data elements necessary for a test of recovery models for adolescents receiving services within 3 treatment modalities.

4.4. Conclusion

Overall, results of the present study extend the literature on adolescents and document the importance of motivation, therapeutic relationships, and other factors in the recovery process. Findings document that internal motivation promotes the development of therapeutic relationships, which in turn improves outcomes following treatment. A difference between the present findings and similar studies of adults was the relative importance of treatment retention and treatment engagement on illegal drug use. While retention was found to be a significant factor, counselor relationship even very early in treatment proved to be equally important.

The lack of significant direct effects of DSM diagnosis and legal pressures on treatment engagement provides evidence for the efficacy of treatment in helping individuals who may come to treatment with other issues. While the findings illustrate the importance of counselor relationships in promoting positive change among adolescents in all modalities, they also raise important questions about how youth internalize the lessons learned during treatment and what happens during the process of recovery that drives them to make and sustain positive change both during and following treatment. Because recovery reflects a series of small behavioral changes that occur over time, future efforts should examine youth as they make transitions – during the course of treatment, back into their home and school environments, and as they face temptation and deal with relapse – in order to fully understand the process of change. Understanding more about the barriers they face during those transitions and the resources they utilize in dealing with challenges can aid in designing intervention approaches that better address adolescent needs.

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Figure 1.
Proposed model for adolescent follow-up outcomes

Figure 2.
Estimated common model for follow-up drug use from within covariance matrix (N = 547)

Figure 3.
Estimated common model for follow-up drug use for all adolescents with complete intake
and follow-up data (N = 1287)

Table 1

Comparison of Analysis Samples

Variables	Samples						Comparison C and E
	A. Total (N=1785)	B. Not Complete Intake and Follow-up (n=498)	A-B. Subtotal (n= 1287)	C. Within-Covariance Matrix Deletes for Missing Data (N=674)	D. Deleted for Program Size (N= 66)	E = A-B-C-D. Analysis Sample (N=547)	
Demographics							
Male	70.2%	67.7%	71.2%	72.7%	57.6%	71.1%	ns
Age	15.7 (1.3)	15.6 (1.32)	15.8 (1.3)	15.8 (1.3)	15.7 (1.2)	15.8 (1.3)	ns
White	57%	57.0%	57.1%	56.8%	53.0%	58.0%	ns
African American	21.0%	24.3%	19.7%	19.6%	27.3%	18.8%	ns
Hispanic	17.2%	14.9%	18.1%	19.4%	15.2%	16.8%	ns
Intake Measures							
<i>Motivation</i>							
Problem Recognition ^a	22.4 (6.1)	22.2 (6.1)	22.4 (6.1)	22.3 (6.1)	20.0 (6.9)	22.8 (5.9)	ns
Desire for Help ^a	24.1 (5.6)	24.3 (5.4)	24.1 (5.7)	24.1 (5.7)	22.9 (5.9)	24.2 (5.5)	ns
Treatment Readiness ^a	23.1 (4.9)	23.2 (4.8)	23.0 (4.9)	22.9 (5.1)	22.6 (4.4)	23.2 (4.8)	ns
Legal Pressure	39.0%	32.3%	41.5%	36.2%	31.8%	49%	t=4.61 ^b
DSM Diagnosis	61.1%	60.4%	61.2%	58.9%	50.0%	65.4%	t=2.34 [*]
Illegal Drug Use ^b	5.42 (2.50)	5.16 (2.70)	5.52 (2.41)	5.46 (2.38)	4.27 (2.98)	5.75 (2.33)	t=2.13 [*]
Hard Drug Use ^b	1.61 (2.38)	1.61 (2.43)	1.61 (2.36)	1.43 (2.26)	1.52 (2.26)	1.85 (2.48)	t=3.05 [*]
Weekly Hard Drug Use	26.5%	26.5%	26.5%	23.6%	27.3%	30.0%	t=2.52 [*]
Marijuana Use ^b	5.02 (2.56)	4.73 (2.75)	5.12 (2.48)	5.12 (2.42)	3.48 (2.93)	5.34 (2.42)	ns
Heavy Alcohol Use	29.7%	25.6%	31.2%	30.1%	16.7%	34.4%	ns
Number of Arrests (lifetime)	7.14 (26.35)	6.61 (9.83)	7.33 (30.40)	7.65 (40.28)	5.06 (5.09)	7.23 (13.10)	ns
Number of Arrests (1yr)	2.39 (5.83)	2.42 (6.30)	2.37 (5.63)	2.29 (6.58)	1.55 (3.29)	2.56 (4.48)	ns
During-Treatment							

Variables	Samples						Comparison C and E
	A. Total (N=1785)	B. Not Complete Intake and Follow-up (n=498)	A-B. Subtotal (n= 1287)	C. Within-Covariance Matrix Deletes for Missing Data (N=674)	D. Deleted for Program Size (N= 66)	E = A-B-C-D. Analysis Sample (N =547)	
Measures							
<i>Counselor Relationship</i>	(N= 845)	(N= 158)	(N= 687)	(N= 128)	(N=12)	(N= 547)	
Counselor Understanding ^c	1.48 (.63)	1.44 (.62)	1.49 (.63)	1.37 (.73)	1.50 (.67)	1.51 (.60)	t=2.38*
Counselor Rapport ^d	2.86 (.85)	2.86 (.89)	2.86 (.84)	2.77 (.93)	2.92 1.08)	2.87 (.81)	ns
Individual Counseling Helped Drug Problems ^c	1.17 (.76)	1.06 (.78)	1.19 (.76)	.99 (.82)	1.58 (.69)	1.23 (.73)	t=3.13**
Individual Counseling Helped Other Problems ^c	1.21 (.69)	1.16 (.68)	1.22 (.69)	1.02 (.79)	1.50 (.80)	1.26 (.66)	t=3.36**
<i>In-Treatment Peer Relationships</i>	(N= 1060)	(N= 198)	(N= 862)	(N= 301)	(N= 23)	(N= 547)	
Group Understanding ^d	1.35 (.62)	1.34 (.65)	1.35 (.61)	1.39 (.66)	1.13 (.83)	1.34 (.58)	ns
Group Rapport ^d	2.68 (.76)	2.70 (.80)	2.68 (.76)	2.65 (.80)	2.36 (.84)	2.70 (.73)	ns
Psychological Distress	.20 (.20)	.20 (.20)	.19 (.19)	.17 (.19)	.16 (.19)	.21 (.20)	t=3.47***
Treatment Retention							
Days in Treatment (capped)	90.9 (98.5)	70.6 (87.5)	98.8 (101.4)	96.6 (108.3)	67.4 (69.9)	105.3 (95.0)	ns
Follow-up Measures							
Illegal Drug Use ^b	2.90 (2.77)	3.10 (2.85)	2.82 (2.73)	2.90 (2.72)	3.26 (3.04)	2.67 (2.70)	ns
Marijuana Use ^b	2.53 (2.58)	2.68 (2.65)	2.48 (2.55)	2.55 (2.55)	2.92 (2.82)	2.33 (2.50)	ns
Weekly Hard Drug Use	11.7%	13.3%	11.0%	10.0%	15.2%	11.9%	ns
Heavy Alcohol Use	17.0%	16.1%	17.3%	17.5%	19.7%	16.8%	ns
Cigarettes ^e	1.96 (1.34)	1.85 (1.36)	2.00 (1.33)	1.93 (1.33)	1.48 (1.43)	2.14 (1.30)	t=2.87**
<i>Condom Use</i>							
Vaginal Sex ^f	2.99 (1.10)	2.97 (1.14)	3.00 (1.08)	3.06 (1.08)	2.83 (1.14)	2.95 (1.08)	ns
Anal Sex ^f	3.81 (.69)	3.86 (.62)	3.80 (.72)	3.79 (.73)	3.79 (.73)	3.81 (.70)	ns

Variables	Samples						Comparison C and E
	A. Total (N=1785)	B. Not Complete Intake and Follow-up (n=498)	A-B. Subtotal (n= 1287)	C. Within-Covariance Matrix Deletes for Missing Data (N=674)	D. Deleted for Program Size (N= 66)	E = A-B-C-D. Analysis Sample (N =547)	
Oral Sex ^f	2.53 (1.48)	2.62 (1.47)	2.49 (1.48)	2.47 (1.47)	2.70 (1.47)	2.49 (1.49)	ns
Psychological Distress ^g	1.53 (1.68)	1.66 (1.75)	1.34 (1.64)	1.51 (1.63)	1.68 (1.82)	1.41 (1.63)	ns
School	72.8%	74.4%	72.0%	73.1%	63.6%	72%	ns
Number of arrests	1.05 (2.79)	1.13 (2.42)	1.01 (2.91)	.99 (2.56)	2.00 (7.74)	.94 (2.18)	ns
Illegal Activities	22.4%	24.9%	21.5%	19.7%	24.2%	23.4%	ns

* p<.05

** p<.01

*** p<.001

**** p<.0001

^a range 10-50

^b range: 0-8

^c range: 0-2

^d range: 1-4

^e range: 0-5

^f range: 1-4

^g range: 0-8

Table 2
Treatment Process Model (Standardized Weights) Predicting Follow-up Outcomes for Adolescents (N = 547)

Predictors	Follow-up Outcomes at 12 Months			
	Marijuana Use	Heavy Alcohol Use	Cigarettes	Condom Use
DSM diagnosis (Intake)	.05 (.04), t = 1.20	.04 (.04), t = 1.00	.10 (.04), t = 2.29*	-.03 (.06), t = -.48
Legal pressure (Intake)	-.05 (.04), t = -1.28	.05 (.04), t = 1.26	-.08 (.04), t = -1.79 [†]	.06 (.06), t = .87
Intake drug use	.10 (.04), t = 2.49*	.25 (.09), t = 2.93*	.04 (.04), t = .86	.06 (.06), t = .97
Counselor relationship (mo. 1)	-.15 (.05), t = -3.17*	-.03 (.05), t = -.53	-.01 (.05), t = -.19	.04 (.07), t = .57
In-Trt. Peer relationships (mo. 1)	.02 (.05), t = .31	-.03 (.05), t = -.64	.03 (.05), t = .57	.06 (.08), t = .72
Psychological Distress (mo.1)	.01 (.04), t = .21	-.02 (.04), t = -.54	.00 (.04), t = .07	.04 (.06), t = .68
Treatment retention	-.12 (.04), t = -2.88*	.03 (.04), t = -.65	-.01 (.04), t = -.25	.24 (.06), t = 3.90*
Male	.30 (.11), t = 2.68*	.15 (.11), t = 1.31	.15 (.11), t = 1.30	-.07 (.16), t = -.43
Age	.00 (.03), t = .04	-.02 (.03), t = -.70	-.01 (.03), t = -.56	-.17 (.05), t = -3.49*
White	-.02 (.09), t = -.16	.16 (.10), t = 1.66 [†]	.33 (.09), t = 3.59*	-.37 (.14), t = -2.70*
Covariance w/FU illegal drug use	Not applicable	.38 (.04), t = 10.24*	.19 (.04), t = 4.71*	-.19 (.07), t = -2.92*
Model fit statistics	$\chi^2(91)=243.18$, $p<.0001$, CFI=.90, TLJ=.87, RMSEA=.055 (.047, .064), SRMR=.063	$\chi^2(109)=262.82$, $p<.0001$, CFI=.91, TLJ=.87, RMSEA=.051 (.043, .059), SRMR=.057	$\chi^2(97)=248.61$, $p<.0001$, CFI=.90, TLJ=.86, RMSEA=.053 (.045, .062), SRMR=.060	$\chi^2(131)=332.97$, $p<.0001$, CFI=.88, TLJ=.84, RMSEA=.053 (.046, .060), SRMR=.059

	Psychological Distress	School	Arrests	Illegal Activities
DSM diagnosis (Intake)	.08 (.04), t = 1.89 [†]	.06 (.04), t = 1.48	.07 (.04), t = 1.59	.07 (.04), t = 1.51
Legal pressure (Intake)	-.02 (.04), t = -.42	-.07 (.04), t = -1.67 [†]	.06 (.04), t = 1.30	-.03 (.04), t = -.77
Intake drug use	-.01 (.04), t = -.25	-.03 (.04), t = -.65	.05 (.04), t = 1.08	.13 (.04), t = 3.06*
Counselor relationship (mo. 1)	-.00 (.05), t = -.04	.09 (.05), t = 1.99*	-.14 (.05), t = -2.94*	-.08 (.05), t = -1.66 [†]
In-Trt. Peer relationships (mo. 1)	-.04 (.05), t = -.84	-.03 (.05), t = -.57	.12 (.05), t = 2.29*	-.05 (.05), t = -.93
Psychological Distress (mo.1)	.27 (.04), t = 6.42*	.06 (.04), t = 1.30	.06 (.04), t = 1.28	-.01 (.04), t = -.14
Treatment retention	-.05 (.04), t = -1.23	-.02 (.04), t = -.51	-.05 (.04), t = -1.25	-.05 (.04), t = -1.26
Male	-.27 (.11), t = -2.55*	.02 (.11), t = .22	.13 (.11), t = 1.15	.26 (.11), t = 2.35*

	Psychological Distress	School	Arrests	Illegal Activities
Age	.01 (.03), t = .30	-.20 (.03), t = -6.07*	-.03 (.03), t = -.87	-.01 (.03), t = -.37
White	-.04 (.09), t = -.39	.18 (.09), t = 1.97*	-.20 (.09), t = -2.14*	-.01 (.10), t = -.13
Covariance w/FU illegal drug use	.40 (.04), t = 11.22*	-.10 (.04), t = -2.44*	.20 (.04), t = 4.83*	.48 (.03), t = 14.31*
Model fit statistics	$\chi^2(97)=253.01$, $p<.0001$, CFI=.91, TLI=.87, RMSEA=.054 (.046, .062), SRMR=.060	$\chi^2(97)=250.47$, $p<.0001$, CFI=.90, TLI=.86, RMSEA=.054 (.046, .062), SRMR=.060	$\chi^2(97)=248.56$, $p<.0001$, CFI=.90, TLI=.86, RMSEA=.053 (.054, .062), SRMR=.059	$\chi^2(97)=265.87$, $p<.0001$, CFI=.90, TLI=.86, RMSEA=.056 (.048, .065), SRMR=.061

† p<.10
 * p<.05
 * p<.01
 * p<.001
 * p<.0001