Treating adolescent drug abuse: a randomized trial comparing multidimensional family therapy and cognitive behavior therapy

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ABSTRACT

Aim   To examine the efficacy of two adolescent drug abuse treatments: individual cognitive behavioral therapy (CBT) and multidimensional family therapy (MDFT). **Design**   A 2 (treatment condition) x 4 (time) repeated-measures intent-to-treat randomized design. Data were gathered at baseline, termination, 6 and 12 months post-termination. Analyses used latent growth curve modeling. **Setting**   Community-based drug abuse clinic in the northeastern United States. **Participants**   A total of 224 youth, primarily male (81%), African American (72%), from low-income single-parent homes (58%) with an average age of 15 years were recruited into the study. All youth were drug users, with 75% meeting DSM-IV criteria for cannabis dependence and 13% meeting criteria for abuse. **Measurements**   Five outcomes were measured: (i) substance use problem severity; (ii) 30-day frequency of cannabis use; (iii) 30-day frequency of alcohol use; (iv) 30-day frequency of other drug use; and (v) 30-day abstinence. **Findings**   Both treatments produced significant decreases in cannabis consumption and slightly significant reductions in alcohol use, but there were no treatment differences in reducing frequency of cannabis and alcohol use. Significant treatment effects were found favoring MDFT on substance use problem severity, other drug use and minimal use (zero or one occasion of use) of all substances, and these effects continued to 12 months following treatment termination. **Conclusion**   Both interventions are promising treatments. Consistent with previous controlled trials, MDFT is distinguished by the sustainability of treatment effects.

Keywords   Adolescent drug abuse, adolescent treatment research, cognitive behavioral therapy, family-based interventions, multidimensional family therapy, randomized controlled trial.

INTRODUCTION

Although treatment research for adolescent drug problems has increased, it is still sparse when compared with treatment studies of other child and adolescent disorders, such as anxiety, attention deficit hyperactivity disorder (ADHD) and depression [1]. Reviews and practice guidelines identify family therapy as a promising treatment [2] and, according to some, it is the treatment of choice for adolescent drug abuse [3]. Adolescents with serious drug problems can be engaged and retained successfully in family treatment, significant drug use reductions can be achieved in relatively short-term therapy [4], and using state-of-the-science treatments at least, these gains can be sustained for 6–12 months post-treatment [5,6]. However, with a few exceptions (e.g. [5,6]), most studies have not compared family therapy with another active (i.e. theory-based, manual-guided, expert-led) alternative treatment.

Despite the development of effective family-based adolescent drug treatments, most adolescent therapies have an individual or peer focus [7,8]. Cognitive behavioral therapy (CBT) is an approach that shows promise in treating adolescent substance use [9], as do some newer

treatments that combine CBT and family therapy approaches [6,9].

The present study compares experimentally the efficacy of two manual-guided therapies, an individual CBT approach [10,11] and a family-based treatment, multidimensional family therapy (MDFT) [12]. Although previous studies have compared family-based approaches to a variety of group and some individual treatments for adolescent drug abuse, this study is distinctive in that it is a fully randomized study comparing two state-of-the-art treatments on both short- and relatively longer-term effects (1 year). Previous studies comparing individual and family-based treatments have either not used manual-guided individual therapy comparison treatments or have not assessed treatment durability (e.g. 1-year follow-up). Because previous research has suggested that both CBT and MDFT are effective, we expected both treatments to decrease adolescent drug use. However, because multi-systems-oriented family therapies target individual and interactional change in the parent and family, the ways in which the parent, youth and family interact with their immediate social environment, as well as in the adolescent, we expected the treatments to have different longer-term outcomes. In line with these assumptions about the potential importance of crafting comprehensive interventions that target the range of known risk and protective factors at individual, family and contextual levels, as well as previous research on family-based therapies [2–4], we expected treatment with the more comprehensive focus, MDFT, to create changes that had longer durability.

METHODS

Participants

To be eligible for the study, participants had to: (i) be between the ages of 12 and 17.5 years; (ii) living with at least one parent or parent-figure who could participate in the family therapy if assigned to that condition; (iii) have no history of organic dysfunction; (iv) not currently need in-patient detoxification; and (v) not be actively suicidal. Referrals to the study were made from the juvenile justice system (48%), child welfare service agencies (36%), schools (11%) or other sources (5%). A total of 287 youth and families were referred to the study, 224 of whom (78%) completed an intake interview and agreed to participate in the study. Reasons for non-participation included repeated non-appearance for scheduled intake appointments ($n = 43$), the youth running away from home ($n = 6$) or being sent to residential treatment ($n = 14$) before the intake appointment. Youth were mainly male, African American, 15 years old from low-income homes (Table 1). All youth were drug users, with

75% meeting DSM-IV criteria for cannabis dependence, 20% alcohol dependence and 13% other drug dependence, and 13%, 4% and 2% for cannabis, alcohol and other drug abuse, respectively. Please note that participants could meet diagnostic criteria for more than one substance use disorder.

Research procedures

Research staff contacted parents and youth to describe study procedures, including random allocation to treatment condition, and to obtain written informed consent prior to the first assessment session. Staff explained the voluntary nature of participation and that parents and youth could discontinue participation at any time. Next, a 90-minute research assessment was completed with parents and youth by staff, who received approximately 30 hours of initial training and continuing supervision to standardize data collection procedures. After the baseline assessment, we used a block randomization procedure [13]. Each block consisted of a random ordering of each treatment twice (four slots per block, two for MDFT and two for CBT for a total of 56 blocks), to allocate adolescents randomly to either individual CBT ($n = 112$) or MDFT ($n = 112$). Follow-up assessments were conducted at termination of treatment, and then at 6 and 12 months following treatment termination.

Treatment conditions

Both MDFT and CBT were delivered in 60–90-minute weekly, office-based sessions. The treatment was provided free and transportation support (bus and subway tokens) was available to lessen obstacles to treatment. The only difference between the treatments was the active ingredients of the therapy (e.g. family, individual). Treatment duration, dose and service delivery format were identical.

CBT is based on a broadly defined cognitive behavioral theory [14]. The adolescent-focused CBT used in this study was also influenced by dialectal behavior therapy [15]. These models hypothesize substance use as a learned behavior started and maintained in the context of environmental factors. The social learning model uses classical and operant learning principles, acknowledges the influence of environmental events on the behavioral development and recognizes the role of cognitive processes in health and dysfunction.

Treatment occurs in three stages. Phase one determines and prioritizes adolescents' problems and constructs the treatment contract. In this version of individual CBT, parents attended the first two sessions to support the adolescent's participation in treatment and to elicit parents' perspectives on the youth's problems. A

Table 1 Sample characteristics.

Variable	MDFT	CBT	Overall
Age [M (SD)]	15.3 (1.25)	15.5 (1.21)	15.4 (1.23)
Gender [n (%)]			
Male	92 (82)	90 (80)	182 (81)
Female	20 (18)	22 (20)	42 (19)
Ethnicity/race [n (%)]			
African American	80 (71)	81 (72)	161 (72)
White, non-Hispanic	19 (21)	19 (17)	40 (18)
Hispanic	10 (11)	12 (11)	23 (10)
Family income (median)	$13 000	$12 000	$13 000
Mother's education [n (%)]			
<High school	37 (33)	34 (33)	71 (33)
High school graduate	37 (33)	43 (42)	80 (37)
Some college/post-high school	25 (22)	23 (22)	48 (22)
College graduate	10 (9)	3 (3)	13 (6)
Graduate/professional degree	2 (2)		2 (1)
Family structure [n (%)]			
Single parent	67 (60)	62 (55)	129 (58)
Two parents	22 (20)	16 (14)	38 (17)
Blended	14 (13)	20 (18)	34 (15)
Other	9 (8)	14 (13)	23 (10)
Age first used cannabis (years) [n (%)]			
< 12	14 (13)	10 (9)	24 (11)
12–14	68 (62)	59 (55)	127 (59)
15–18	26 (24)	37 (35)	63 (29)
Never used	2 (2)	1 (1)	3 (1)
Adolescent on probation	71 (63)	66 (59)	137 (61)
Diagnosis [n (%)]			
Cannabis abuse	14 (13)	14 (13)	28 (13)
Cannabis dependence	81 (72)	80 (75)	161 (75)
Alcohol abuse	4 (4)	4 (4)	8 (4)
Alcohol dependence	24 (22)	18 (17)	42 (20)
Other substance abuse	4 (4)	0 (0)	4 (2)
Other substance Dependence	16 (15)	12 (11)	28 (13)
Number of comorbid [M (SD)]	2.63 (2.1)	2.47 (2.0)	2.55 (2.1)

CBT: cognitive behavioral therapy; MDFT: multidimensional family therapy; SD: standard deviation.

problem list is created from the adolescent and parents' description of the problems and from school and juvenile court reports. Problems are then prioritized into five levels according to a hierarchy system. The first priority level consists of life-threatening problems. The second level includes threats to physical wellbeing (e.g. physical abuse, neglect). Level three (priority problems) includes severe mental illness and physical health disabilities which, if left untreated, will compromise efforts to reduce substance use. Decreasing therapy-interfering behaviors such as missing sessions or refusal to work on substance use reduction are level four priorities. Quality-of-life-interfering behaviors, including substance abuse, delinquent behavior and similar problems are level five targets. Once the treatment plan is developed, both adolescents and their parents sign a treatment contract specifying their obligations to the therapeutic process.

The middle phase of treatment implements the CBT regimen. The goals of this phase are to increase coping competence and reduce behaviors that threaten client safety, health and quality of life. Intervention selection is based upon a modular approach and clinicians choose treatment strategies from those listed by standard CBT manuals [16,17]. Typical therapeutic modules include: (i) providing information and education; (ii) contingency contracting; (iii) self-monitoring; (iv) problem-solving training; (v) communication skills training; (vi) identifying cognitive distortions; (vii) increasing healthy recreational activities; and (vii) homework assignments. Harm reduction, not abstinence, is the primary substance abuse-related goal.

The highest priority problems are addressed first. Therapists do not tackle the next problem level until the higher priority problems are resolved. If clients do not have problems at a specific level, treatment planning moves to the next level in the hierarchy. Problems and behavioral dysfunctions within a specific level are targeted for simultaneous intervention. Therapy's final phase focuses upon relapse prevention. Role rehearsal and problem-solving are used to strengthen clients' ability to resist peer pressure to use drugs and engage in delinquent behavior.

Multidimensional family therapy (MDFT)

MDFT is a family-based treatment system for adolescent drug abuse and related behavior problems with several versions (e.g. office-based, in-home, brief, intensive outpatient, day treatment, residential treatment) [18]. MDFT can be delivered from one to three times per week over the course of 4–6 months depending upon the treatment setting, the severity of adolescent problems and family functioning. In the current study we used a once-per-week, office-based version of MDFT. In all versions, however, therapists work simultaneously in four interdependent treatment domains according to the particular risk and protection profile of the adolescent and family. The adolescent domain helps teens to engage in treatment; communicate effectively with parents and other adults; develop coping, emotion regulation and problem-solving skills; improve social competence and school or work functioning; and establish alternatives to substance use and delinquency. The parent domain engages parents in therapy; increases their behavioral and emotional involvement with the adolescents; improves parenting skills, especially monitoring, clarifying adolescent expectations, limit setting and consequences; and addresses their individual psychosocial functioning apart from their role and responsibility as a parent. The interactional domain focuses upon decreasing family conflict, and improving emotional attachments, communication and problem-solving skills. The extrafamilial domain fosters family competency within all social systems in which the teen participates (e.g. school, juvenile justice, recreational). At various points throughout treatment therapists meet alone with the adolescent, alone with the parent(s), or with the adolescent and parent(s) together, depending upon the specific problem being addressed [19]. Each weekly session typically included a family session, and a session with the parent alone and/or the adolescent alone.

Therapists

Twelve therapists, six in each condition, delivered the treatments. Therapists were nested within each treatment condition. Therapists in each treatment had similar experience and educational backgrounds before study participation, and they were divided evenly between men and women. Fifty per cent were white non-Hispanic and 50% were African American, ranging in age from 29 to 54 years (M = 40). Of the MDFT therapists, four of the therapists had Master's and two had doctoral degrees; and of the CBT therapists, three had Master's degrees and three had doctoral degrees.

Treatment fidelity

Treatment adherence was assessed on 90 therapy sessions selected randomly from 36 subjects (19 from MDFT and 17 from CBT). Trained raters were 11 undergraduate students who had no prior experience with coding or the treatment models. We assessed treatment adherence with the Therapist Behavior Rating Scale (TBRS) [20], an instrument that identifies 26 core therapeutic techniques and non-specific facilitative interventions associated with MDFT and CBT. Raters were trained in weekly 2-hour meetings over a 5-month period by two clinical psychologists who were themselves trained and supervised by both model developers (H. Liddle and R. Turner) in fidelity ratings for their respective models. Training consisted of didactic instruction and discussion of the coding manual, in-group coding and review of practice tapes and exercises designed to increase understanding of the scale items. Raters demonstrated acceptable reliability for each TBRS item (ICC > 0.60) before beginning to code study tapes. Raters continued to meet weekly for the duration of the study for booster training and to prevent rater drift. Raters were unaware of the study's goals as well as the fact that two different treatments were being evaluated. They were instructed that participant configuration in each session would vary according to the needs of each case and were informed that each intervention may or may not occur in any given session. Raters coded entire videotaped therapy sessions, which ranged from 30 to 75 minutes and averaged approximately 60 minutes per session. Raters were blind to the treatment condition, therapist and session number of the videotapes they coded. Two raters coded each videotape; raters were assigned to tapes using a randomized block design [21], such that coders were paired randomly with one another across the sample of tapes. Mean comparisons between the treatment conditions revealed that MDFT therapists scored significantly higher on the MDFT scale [$t (56) = 10.22$, $P < 0.001$], whereas CBT therapists scored at higher levels on the CBT scale [$t (49) = 6.77$, $P < 0.001$]. These results confirm that each condition emphasized model-unique techniques and avoided interventions prescribed in the other treatment.

Measures

Intake interview

Demographic and background information was obtained in the intake interview, including youth age, gender, race/ethnicity (African American, Hispanic, white non-Hispanic), family composition, mother's education, family income, age of first drug use and juvenile probation status. Diagnoses of youth were obtained from the Diagnostic Interview for Children (DISC).

Substance use

We used a comprehensive approach to measuring adolescent drug abuse problem severity by including reports of psychological involvement with drugs as well as frequency of use. Because of the complex and variable nature of adolescent substance use, we took the approach that a broad view measuring both frequency and psychological involvement would provide the most clinically relevant depiction of adolescent drug abuse.

Personal experience inventory (PEI)

The PEI [22] is a multi-scale self-report measure assessing substance use problem severity and psychosocial risk. We used the Personal Involvement with Chemicals scale, a 29-item measure that focuses upon the psychological and behavioral depth of substance use and related consequences in the previous 30 days. This scale's items address substance use to feel calm; substance use during the whole day, weekends or school; and canceling plans to get high [23].

Time-line follow-back method (TLFB)

Employing a calendar and other memory prompts to stimulate recall, the TLFB measured 30-day retrospective reports of daily frequency of substance use [24]. Youth were asked to report on specific substances used daily for the period just before the intake evaluation and each follow-up evaluation. Data analyses used days of cannabis use and other drugs (e.g. cocaine, opiates) over a 30-day period.

Design and analytical approach

The aim of the study was to determine the efficacy of MDFT versus individual CBT using a 2 (treatment condition) × 4 (time) repeated-measures intent-to-treat design. Individual client change was analyzed using latent growth curve modeling (LGM) [25]. LGM represents a conceptual advance over traditional repeated-measures analysis of variance (ANOVA) or multiple analyses of variance (MANOVA) in that change is viewed as a continuous process that reflects individual differences as well as group-level averages. Missing data were accommodated by using all available data through full informa-

tion maximum likelihood (FIML) estimation and the expectation-maximization algorithm [26]) carried out using Mplus software [27]. FIML estimation is recognized widely as an optimal method for dealing with missing data in randomized controlled trial research designs [28,29]. Although, technically, FIML estimation produces only unbiased estimates under the assumption that the data are missing at random (MAR, meaning that missingness is not distributed randomly across all observations but is random within each independent variable), the MAR assumption is not directly testable. Further, simulation studies have shown that even when the MAR assumption is violated, FIML produces superior estimates than other commonly used methods such as listwise deletion, last data point carried forward and mean substitution, all of which (unlike FIML) are ad hoc techniques not derived from statistical theory [30]. Because we limited the number of comparisons we tested to those that were either related directly to our hypotheses or necessary to evaluate the effectiveness of the interventions, we used an alpha of 0.05 for each comparison. In addition, some applied statisticians have recommended against adjusting alpha, given that no agreed-upon procedure exists and because useful findings may be ignored due to an over-reliance upon dichotomous decision rules [30,31].

Latent growth curve modeling proceeded in three stages. First, a series of growth curve models, representing different possible forms of growth (e.g. no change, linear change, curvilinear change), was tested to determine the overall shape of the individual change trajectories. Robust maximum likelihood estimation, which estimates accurately the standard errors of non-normal variables, was used to model change in substance use problem severity and the frequency of cannabis, alcohol and other drug use. Time was coded so that the intercept was equal to zero at intake and thus represents the client's baseline value on the dependent measure. Next, to test the study hypotheses, we added treatment condition to the models to test the impact of treatment on initial status and change over time. Treatment effects were based on the significance of the slope parameter associated with treatment condition. Finally, covariates—adolescent age, gender, ethnicity, juvenile justice involvement and number of therapy sessions—were added to the model to find out if treatment effects remained after adjusting for demographic and other theoretically relevant variables. Mplus software (version 3) [26] was used to conduct the growth curve modeling.

RESULTS

Preliminary analyses

Results showed no differences between the two treatment groups on baseline variables, treatment retention or

Table 2 Observed sample means and standard deviations for drug use problem severity, cannabis use, other drug use and abstinence.

	Intake M (SD)	*Termination* M (SD)	*6-month follow-up* M (SD)	*12-month follow-up* M (SD)
Drug use problem severity				
MDFT	28.47 (17.36)	19.75 (18.18)	18.88 (17.86)	11.66 (17.67)
CBT	27.41 (15.65)	27.39 (19.71)	20.35 (18.73)	19.43 (20.30)
Cannabis use				
MDFT	10.41 (11.38)	5.12 (8.30)	5.77 (8.58)	4.30 (10.15)
CBT	11.89 (12.71)	9.83 (15.56)	6.74 (11.95)	6.41 (11.23)
Alcohol use				
MDFT	1.74 (3.20)	1.43 (3.61)	1.70 (5.41)	2.00 (4.64)
CBT	2.66 (7.28)	1.61 (3.94)	0.96 (2.72)	2.17 (4.37)
Other drug use				
MDFT	1.63 (5.07)	0.55 (2.31)	0.37 (1.56)	0.14 (0.65)
CBT	0.52 (1.41)	1.43 (5.97)	0.32 (1.54)	1.00 (4.00)
30-day minimal use [n (%)]				
MDFT	8 (7)	27 (42)	28 (42)	47 (64)
CBT	6 (4)	23 (39)	24 (45)	28 (44)

Means for cannabis, alcohol and other drug use represent the average number of days used in the previous 30. Values represent observed sample means, and may reflect some bias at termination and 6- and 12-month follow-up assessments due to participant attrition. Latent growth curve modeling results (reported in Tables 3 and 4) are based on model-estimated means, which are unbiased estimates. CBT: cognitive behavioral therapy; MDFT: multidimensional family therapy; SD: standard deviation.

treatment dosage (i.e. number of sessions participants received or the total time they were in treatment). Also, there were no significant therapist effects. Both treatments experienced similar rates of enrollment (22 individuals refused treatment in each condition) and retention (the median number of sessions of therapy was eight). Missing data due to missed assessments at each follow-up assessment was 45% at treatment discharge ($n = 47$ for MDFT; $n = 53$ for CBT), 46% at the 6-month follow-up ($n = 45$ for MDFT; $n = 59$ for CBT) and 39% at the 12-month follow-up ($n = 39$ for MDFT; $n = 49$ for CBT), although it was common for a participant to miss an assessment but complete a following assessment. Further, at each follow-up assessment, the prevalence of missing data did not differ by treatment condition [$\chi^2_{(1,N = 224)} = 2.44$, $P = 0.118$].

Outcome analyses

Table 2 provides the observed means and standard deviations (see Table 2 note) for substance use problem severity and 30-day frequency of cannabis use, alcohol use, other drug use and minimal use.

Time effects

Results of likelihood ratio difference tests established that linear models best fitted the substance abuse problem severity change trajectories [$\Delta\chi^2_{(1,N = 224)} = 46.99$, $P < 0.001$]. Adding a quadratic growth factor to the linear model did not improve fit significantly [$\Delta\chi^2_{(4,N = 224)} = 3.90$, $P > 0.05$]. Similarly, for cannabis use, the linear growth model also fitted the data better than either an intercept only [$\Delta\chi^2_{(3,N = 224)} = 42.04$, $P < 0.001$] or quadratic model [$\Delta\chi^2_{(4,N = 224)} = 5.30$, $P > 0.05$]. These findings indicate that both treatments showed statistically significant decreases in substance use problem severity and 30-day frequency of cannabis use.

Treatment effects

After selecting the linear slope models as best-fitting, we tested treatment effects by adding treatment condition as a between-subjects covariate to the growth models. Treatment condition was centered at intake, and the intercept and slope parameters were regressed on the treatment condition variable. Table 3 presents the t-ratios and P-values for the test of treatment slope comparisons as well as intercept and slope main effects. As seen in Table 3, the slope parameter associated with treatment condition was statistically significant for substance use problem severity, with greater decreases associated with MDFT.

Having observed a significant difference in slopes of the substance use problem severity, we were interested in assessing at which point the treatments diverged. This was accomplished by shifting the location of the intercept to later assessments and testing this point estimate for statistical significance. The intercept parameter was significant when set at the 6-month follow-up ($t = 2.12$, $P < 0.05$) and at the 12-month follow-up ($t = 2.32$, $P < 0.05$), indicating that youth receiving MDFT reported significantly less substance use problem severity at the 6- and 12-month follow-up assessments than youth

Table 3 Tests of slope main effects and growth factor by treatment interactions for drug use problem severity, cannabis use, alcohol use and other drug use.

Outcome measure	Growth factor mean				Treatment differences			
	Intercept		Slope		Intercept		Slope	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Drug use problem severity	28.20***	3.52	−7.69***	1.78	−0.17	2.21	2.39*	1.13
Cannabis use	6.13***	1.69	−2.25	1.15*	1.68	1.17	0.16	0.78
Alcohol use	0.23**	0.08	−0.04	−0.94	0.01	0.05	0.02	0.03
Other drug use†	0.84***	0.03	0.04***	0.01	0.05	0.04	−0.03	0.01*

$*P < 0.05$; $**P < 0.01$; $***P < 0.001$. †Because other drug use was inverse-transformed, a positive slope indicates a decrease in other drug use. SE: standard error.

receiving CBT (differences between treatments were not significant at intake or treatment discharge), with effect sizes in the moderate range for the 6-month follow-up (Cohen's $d = 0.39$) and in the moderate–large range for the 12-month follow-up ($d = 0.59$). In other words, youth who received MDFT retained their treatment gains more effectively than those receiving CBT.

There were no significant treatment effects for 30-day frequency of cannabis use. The slope parameter associated with treatment condition was not statistically significant (see Table 3). The significant negative slope main effects, however, suggest that both treatments were equally effective in reducing frequency of cannabis use.

Alcohol and other drug use

Although cannabis was the substance abused most often by these youth, certain youth also abused other substances [most often alcohol, phencyclidine (PCP), sedatives and cocaine, described as other drug use below]. We examined changes in frequency of alcohol use and other drug use (defined as drug use other than cannabis and alcohol) separately. For alcohol use, we transformed participants' reports on the TLFB using a natural log transformation to increase the normality of the data. Table 3 shows that there was a small trend associated with decreases in alcohol use in participants as a whole, but there were no significant between-treatment differences. The measure of other drug use frequency was non-normal with a severe positive skew, therefore we applied the inverse transformation [32,33] with these data. As shown in Table 3, the slope parameter associated with treatment condition was statistically significant for other drug use, with results again favoring MDFT ($t = −2.14$, $P < 0.05$, $d = 0.32$). Recall that we also used the robust maximum likelihood estimator as another protection against biased estimates arising from non-normal data.

Abstinence or minimal alcohol and drug use

Following Waldron *et al.*, we defined minimal use as zero or one occasion of alcohol or drug use [6]. The proportion of youth reporting minimal substance use at the 12-month follow-up was 64% of MDFT youth and 44% of CBT youth reporting zero or one use, a statistically significant difference [$\chi^2_{(1, N = 224)} = 5.43$, $P = 0.020$]. The findings remained statistically significant when complete abstinence was examined [$\chi^2_{(1, N = 224)} = 5.24$, $P = 0.022$]. This corresponds to the previous findings that youth receiving MDFT were more likely to sustain treatment gains through the 1-year follow-up than youth receiving CBT [34].

Additional covariates

Finally, we examined whether adolescent age, gender and ethnicity as well as juvenile justice involvement and number of therapy sessions were important between-subjects covariates and whether any statistically significant covariates moderated treatment effects. Each covariate was first tested individually; subsequently all covariates were then entered simultaneously, along with treatment condition, to test the unique effects of each while controlling for the effects of the others. As shown in Table 4, the number of therapy sessions was related to lower drug abuse problem severity. We found that both treatment condition and session main effects were significant; the interaction of treatment condition and sessions was not significant. We performed the same analyses using weeks in treatment rather than number of sessions as a covariate and found the same general pattern of results, although relationships were typically stronger for number of sessions. These findings indicate that youth who received more treatment, and those not involved in the juvenile justice system, showed more rapid decreases in drug use problem severity. In addition, youth involved in the juvenile justice system showed more rapid

Table 4 Critical ratio tests for relationship between covariates and the latent growth factors.

Covariate	Intercept	Slope
Drug use problem severity		
Age	0.19	−0.99
Gender	1.11	−1.43
Ethnicity (1 = African American)	2.84**	−0.01
Juvenile justice involvement (1 = involved)	−1.01	−2.01*
Number of therapy sessions	1.39	−1.97*
Treatment condition (0 = MDFT; 1 = CBT)	0.02	2.17*
Cannabis use		
Age	−1.64	0.02
Gender	−0.72	−0.46
Ethnicity	1.29	−0.01
Juvenile justice involvement	−1.37	−0.55
Number of therapy sessions	−0.94	−1.26
Treatment condition	1.50	0.07
Alcohol use		
Age	−1.64	0.02
Gender	0.26	−0.24
Ethnicity	4.75***	−0.68
Juvenile justice involvement	−2.41*	2.51**
Number of therapy sessions	1.74	1.38
Treatment condition	0.23	0.11
Other drug use		
Age	1.38	1.82
Gender	−2.96**	1.16
Ethnicity	−4.56***	1.39
Juvenile justice involvement	−1.91	−0.89
Number of therapy sessions	0.64	−0.74
Treatment condition	1.38	2.22*

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$. CBT: cognitive behavioral therapy; MDFT: multidimensional family therapy.

decreases in alcohol use; interactions with treatment condition were not statistically significant.

CONCLUSION

This study examined the comparative efficacy of two theoretically and operationally different manual-guided, office-based out-patient psychotherapies for adolescent drug abuse—the family-focused MDFT and the individually focused CBT. We assessed five components of adolescent substance abuse: (i) drug use problem severity; (ii) 30-day frequency of cannabis use; (iii) 30-day frequency of alcohol use; (iv) 30-day frequency of other drug use; and (v) 30-day minimal drug use. The findings indicate the promise of both treatments. With respect to changes in frequency of cannabis use, there were no statistically significant treatment differences. In comparison to other randomized controlled trials testing CBT, these two treatments showed approximately equivalent or larger reductions in cannabis use, both during treatment and to the

6-month follow-up [6]. These results build upon other adolescent drug abuse treatment studies which indicate that, under certain conditions, both family-based and CBT approaches are efficacious treatments [6].

However, if we widen the lens through which we evaluate the treatments, additional and clinically meaningful information on differential treatment outcomes emerge. MDFT was superior to CBT in decreasing drug abuse problem severity. The differential impact of the treatments on substance-related problems is important because they reveal the extent of impairment resulting from drug use. These aspects of functioning may remain obscured if assessments measure only substance use frequency [35]. Therefore, on a measure assessing functional impairment due to drug use, youth receiving the family-based treatment fared better than youth receiving CBT.

An important consideration for clients, clinicians, policy makers and treatment service payers is the sustainability of treatment gains. Given the low rates at which youth seek drug abuse treatment, the less than ideal quality and quantity of services that are available and the high treatment dropout rates [7], we were keenly interested in each treatment's capacity to create change that persisted after therapy ended. It is customary to conclude that treatments are promising if they show positive outcomes at discharge and in the immediate period following treatment completion. However, only longer follow-up assessments can determine if post-therapy gains can be maintained relative to any number of factors such as core developmental dysfunctions and the influence of environmental phenomena that continue to be present over time. Along these lines, we now know that evaluations performed at the end of treatment, or shortly thereafter, tend to overestimate the enduring effects of treatment [2]. Furthermore, today's scientific standards demand identification of a treatment's impact in longer-term assessments. In the current study, MDFT-treated adolescents were more successful in maintaining changes over time in substance use problem severity, other drug use and abstinence. The rate of symptom amelioration in substance use problem severity is different, such that MDFT was able to maintain the symptomatic reductions at 6 and 12 months post-treatment. The current study is one of a handful of randomized controlled trials of any treatments that have found durable between-treatment differences on substance use at 1 year following treatment [5,36,37].

The results regarding the sustainability of gains achieved in MDFT is also consistent with the findings about other drugs and abstinence. Twelve months following intake, those who received MDFT decreased their frequency of other drug use compared with CBT youth. MDFT showed a 77% decrease while CBT participants

increased the frequency of using these substances. Finally, concerning 30-day abstinence at 12 months following baseline, youth receiving MDFT were more likely to be abstinent than youth receiving CBT. One year after intake more than half of MDFT youth (64%) showed minimal use compared with 44% with CBT. Both MDFT and CBT compare favorably to the 32% average 12-month abstinence rate following particular state-of-the-science treatments [4].

The impact of MDFT was strongest after treatment's completion rather than during the period of active intervention. The differential impact of the two treatments during this post-intervention period suggests that treatments involving the family, and focusing upon changing the family environment and parenting practices lead to significant improvement in the youth's substance use problems. According to some experts, parent involvement in treating adolescent drug problems has now become an expected treatment ingredient [37].

It is important to recognize that these results were achieved with two theoretically distinct therapies both delivered in a standard service format (i.e. weekly, office-based psychotherapy) and not as part of a comprehensive treatment program. The fact that improvement in substance use was found in two treatments, fairly modest in duration and dose, is an important indicator of the promise of CBT and especially MDFT in adolescent drug abuse treatment. Although the data show efficacy, clearly there is room for improvement and treatment development. For example, the success of comprehensive treatments [38], family preservation service delivery models [39] and well-organized case management and other aftercare services [40] suggests that even more gains might be achieved by integrating the psychotherapeutic models tested here with specific ingredients such as a team-based intervention framework; a systematic and fully comprehensive focus on social–ecological influences, particularly schools and juvenile justice; integrating case management activities into the treatments; service delivery format of home-based therapy sessions delivered more than once per week; and low case-loads [18,19]. The results also suggest that interventions incorporating principles of both family therapy and CBT might lead to improved outcomes [6,9] as well (note that MDFT includes a significant component of work focusing upon the individual adolescent in both individual and family sessions).

Study limitations should be acknowledged. First, generalizability of the results may be limited to the primarily low-income, urban, African American males and their families who participated in this study. Secondly, the results are based on self-report data because urine analysis and parent reports were not available. While self-reports of drug use have been shown to be valid [23,41],

the study would have been strengthened by having additional data sources. Thirdly, we did not adjust for multiple statistical comparisons; consequently, some of the findings may be subject to inflation of Type I error. Therefore, replication of these findings is needed.

The study also has several strengths. This is a fully randomized design employing two highly developed, promising state-of-the-art adolescent drug abuse treatments, which include a relatively long-term follow-up (1 year). We employed the intent-to-treat design, and used state-of-the-science fidelity procedures. Findings indicate an excellent degree of differentiation between the two treatments. All intervention parameters (e.g. amount of therapeutic contact, location of the treatment, characteristics of the therapists, amount of training and supervision of the therapists), with the exception of the targeted active ingredients (individual versus family), were held constant. Given the well-documented need to develop effective interventions for client groups that are traditionally underserved, this study contributes to that policy-supported public health mandate [42–44].

This comparison of two manual-guided, theoretically and operationally distinctive, clinic-based psychotherapies for adolescent drug abuse indicates the promise of both treatments. The family-based treatment produced more lasting treatment gains. Adding to the growing literature on the efficacy of CBT and particularly family-based adolescent substance abuse interventions [2–4], these findings also support the continued work by US and European researchers and therapy developers to transport empirically supported family-based therapies to community adolescent drug treatment and juvenile justice settings [45–47].

Acknowledgements

Declarations of interest

None.

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