

Changing Provider Practices, Program Environment, and Improving Outcomes by Transporting Multidimensional Family Therapy to an Adolescent Drug Treatment Setting

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Effective interventions for drug abusing adolescents are underutilized. Using an interrupted time series design, this study tested a multicomponent, multi-level technology transfer intervention developed to train clinical staff within an existing day treatment program to implement multidimensional family therapy (MDFT), an evidence-based adolescent substance abuse treatment. The sample included 10 program staff and 104 clients. MDFT was incorporated into the program and changes were noted in the program environment, therapist behavior, and in most (e.g., drug abstinence, and out of home placements) but not all (e.g., drug use frequency) client outcomes. These changes remained after MDFT supervision was withdrawn. (Am J Addict 2006;15:102–112)

Science-based, effective therapies have been developed to treat adolescent drug abuse,¹ but the practice of these treatments in community drug treatment clinics remains the exception rather than the rule.² This continuation of the research-practice divide is particularly troubling given what we are learning about the standard treatment that is available for most drug involved adolescents. Most adolescent treatment programs in standard community-based programs are plagued by high drop out rates, service fragmentation, and failure to address youths' multiple problems. For instance, a national multi-site evaluation of teen drug abuse treatment programs, found only 27% of youth completing outpatient therapy, and, according to these data the use of hard drugs increased over the course of treatment.³ Providers are unable to meet the needs of substance abusing youth with multiple problems, including those with comorbid disorders

and legal involvement. These circumstances have commanded the attention of policy makers, managed care organizations, third-party payers, and local, state, and federal funding agencies to expedite the movement of research-based adolescent drug treatments to community settings.⁴

But dire need does not mean that the task is simple. Transporting research-based therapies to non-research environments is complex and difficult.⁵ We have learned a great deal about the challenges of this kind of work. Although effective, characteristics of the models themselves and provider factors interact to create formidable obstacles to adoption of science-based treatments. Treatments developed for research purposes are not generally designed to accommodate to the features of community clinics. Therapists in community clinics typically handle large caseloads, and do not receive clinical supervision that addresses their clinical development. Although interested in new therapies that could enhance their skill and effectiveness, community clinicians feel overburdened, and have few incentives or opportunities to learn manual-guided treatments. Systemic factors are at play as well. Community-based treatment programs rarely have an organizational structure, the financial resources and/or reimbursement system to implement new treatments.

Still, solutions, or at least recommendations, about how to instigate progress exist.⁶ Experts in technology transfer recommend a high level of collaboration between clinical researchers and providers to adapt the agency's infrastructure so as to support the multi-level changes that are required to import new treatments. In particular, appropriate structure, administrative and clinical support, material resources, and adequate incentives must be in place not only to introduce new treatments but also to maintain program refinements over time. The

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increased specification of the barriers to adopting science-based treatments marks progress.⁷ Interventions to improve the status quo depend upon real data about roadblocks, and fresh insights about the specific difficulties involved in change. Recommendations have been made to develop systemically-oriented dissemination models, and evaluate these efforts in multiple domains, including organizational, clinician and client outcomes.⁸

METHODS

Research Design and Procedures

We used a 4-phase interrupted time-series design⁹ to evaluate the effects of integrating a research-supported intervention, Multidimensional Family Therapy¹⁰ (MDFT), into a day treatment program for drug abusing teens. The core research questions addressed whether the technology transfer intervention (described elsewhere) could change (1) providers' clinical practices in accordance with MDFT principles and techniques, (2) the program's therapeutic/organizational climate, or (3) clinical outcomes, and (4) whether any changes effected could be sustained without the presence of the MDFT trainers.

The 12-month Baseline/Pre-Exposure phase (Phase I) assessed program and patient outcomes. In Phase II (Training, 6 mo.) MDFT experts trained Adolescent Day Treatment Program staff and administrators. In Phase III (Implementation, 14 mo.), MDFT experts provided clinical supervision of ADTP staff, coordination with ADTP administrators, and evaluation of all outcomes. At the beginning of phase IV (Durability/ Practice phase, 18 mo.), the technology transfer was complete, and no MDFT supervision occurred. Throughout the Baseline, Implementation, and Durability Phases, data were collected on clinicians' practices, parents' and adolescents' participation in treatment, clients' perceptions of the treatment environment, and adolescents' functioning. Videotaped therapy sessions were rated and all client clinical charts were coded for MDFT adherence. Participants were assessed at treatment intake, 1 month after intake, discharge from treatment, and 9 months after intake.

Participants

ADTP staff, clients, and the adolescents' parents comprised the study sample. The program staff (N = 10) were ethnically diverse (50% Hispanic, 20% African American, 20% White, non-Hispanic, 10% Haitian,) male/80% female, and multidisciplinary including the masters-level Program Director, Medical Director, 5 masters-level social workers, 2 bachelors-level mental health technicians (MHT's), and the registered nurse (R.N.). Two full-time social workers staffed the program at any given time. Because of staff turnover, only one of the five social workers participated during all study

phases. One social worker left 8 months into the Baseline phase, two social workers started 8–10 months into the Baseline phase (one was transferred to another unit before the Baseline phase ended, and the other left half-way through the Implementation phase), and one social worker started half-way through the Implementation phase and remained through the end of the Durability phase. Program directors required staff participation in the MDFT trainings. However, in accordance with International Review Board regulations, staff participation in the research interviews and data collection process was completely voluntary and remained confidential.

Client participants include 104 male and female adolescents admitted to the ADTP during each study phase except the Training phase (38 consecutive admissions during the Baseline phase; 37 during the Implementation phase; and 29 during the Durability phase). Eligibility criteria included the following: (1) Ages 13 to 17, (2) Met DSM-IV criteria for substance abuse or dependence, (3) Either at high risk for residential drug treatment, or transitioning from residential treatment to the community, and (4) Parent or guardian willing to be involved. Exclusion criteria included mental retardation, psychotic symptoms, or current suicidality. Ten adolescents over the course of the study were ineligible. Research staff interviewed all eligible adolescents and their parents upon ADTP admission to explain study details and obtain written informed consent to participate. A total of 16 youth and/or parents declined participation over the course of the study. All procedures, forms, and measures were approved by the University of Miami Miller School of Medicine IRB.

Client participants were referred to the ADTP by substance abuse/mental health facilities (52%), juvenile justice (34%), the school system (7%), or other sources such as family members (7%). The sample included 80 males (77%) and 24 females (23%) living in Miami, FL with an average age of 15 (M = 15.25, SD = 1.24). Youth were predominantly Hispanic (79%; 38% of Cuban descent), 13% were African-American, 1% was white, non-Hispanic, and 7% were of other (mainly Haitian or Jamaican). Half (50%) resided in single parent homes, and the yearly median family income was \$15,600. Upon treatment admission, the program's Medical Director assessed each client to determine psychiatric disorders. At intake, 79% of the participants met criteria for substance dependence, and 30% met criteria for substance abuse (one youth met criteria for both a substance abuse disorder and a substance dependence disorder). Many youth met criteria for a comorbid psychiatric disorder (51% for conduct disorder, 22% for a depressive disorder, 20% for oppositional defiant disorder, and 10% for Attention Deficit Hyperactive Disorder). At intake, almost half (48%) of parents reported that their teens had previously been prescribed medications, and 40% reported that the youth were currently taking psychiatric medications.

The Adolescent Day Treatment Program (ADTP)

Representative of standard day treatment for substance abusing youth, the ADTP is defined as an intensive outpatient 6-month program providing services six hours each day for 5 days per week. The ADTP is affiliated with the University of Miami Medical School/Jackson Memorial Hospital (JMH), the public hospital for Miami-Dade County, Florida. Funded through Medicaid reimbursement, the program uses a social learning approach emphasizing positive reinforcement for appropriate drug and antisocial coping behavior and social skills. A *levels system* provides privileges and specifies responsibilities according to the teen's behavior. The program (before MDFT was introduced) included 1 hour of individual and 5 hours of group counseling, 5 hours of recreational/occupational therapy, and 20 hours of school each week, as well as family therapy as needed.

Multidimensional Family Therapy

Multidimensional Family Therapy¹⁰ (MDFT) is a manual-guided, research-supported treatment for adolescent substance abuse. It has been found to be an effective treatment in several controlled studies with a range of geographically- and ethnically-diverse, juvenile justice involved and comorbid drug-abusing youth and their families. As a developmental-ecological approach, MDFT targets *intrapersonal* aspects including the *adolescent* (e.g., drug use as a means of coping with distress), the *parent(s)* (e.g., parenting practices), *other family members* (e.g., drug using adults in the home), and *interactional patterns* (e.g., parent and teen conflict) that contribute to the continuation of drug use and related problems. The treatment also addresses the adolescent's and family's functioning vis a vis the social systems influencing the teen's life such as school, work, antisocial/drug using peer networks, and the juvenile justice system. Treatment dose varies depending on the severity of the sample, from once a week office based sessions to 3 times per week in-home sessions. The version of MDFT implemented here is unique; it was delivered in the context of the previously described day treatment program. All the treatment was clinic-based; no sessions were held in the home.

Technology Transfer Intervention

MDFT treatment developers conceived of the technology transfer process as involving both adaptation of the therapy approach and its training materials for non-research/community settings, and the active collaboration with the providers in shaping the implementation process. Thus the transportation process, in MDFT terms, was isomorphic with the implementation of the therapy itself, both involving flexibility of the model to fit the particulars of the case/setting, a collaborative team approach, systematic shaping of new behaviors, intervening at all levels of the system, and providing opportunities

to practice and shape new interactions. The technology transfer approach is detailed in a previous publication.¹¹ The same key principles of the MDFT treatment provided the foundation for training the providers to implement the interventions in their setting. These principles, which guide both the MDFT treatment system and dissemination strategy, include a multisystems approach to assessment and intervention; assessing and identifying each team members' contribution to the process; preparing individuals for change; an epigenetic stage model of change, maintaining that development occurs through a series of steps in which new behaviors serve as a necessary platform for more advanced maturation; establishing priorities for intervention; and facilitating positive developmental processes. These principles were integrated in the staff training.

ADTP staff training in MDFT occurred over a 6-month period. Group didactic sessions covered adolescent development, families, drug addiction, the recovery process, and other core MDFT topics. The social workers, mental health technicians (MHTs) and the nurse, and teachers were trained separately to address their specific roles on the unit and to format MDFT materials for their training levels. MHTs and the nurse received 15 hours of training about MDFT interventions, with most emphasis on therapeutic principles and techniques. The teachers received 11 hours of didactic training about teen drug abuse, methods for dealing with classroom behavior problems, and therapeutic classroom activities, such as teaching how to keep a daily diary. In addition to 2 hours of didactic training, two weekly meetings between MDFT trainers and the Program Director and Medical Director addressed training issues. Toward the end of the Training phase, trainers held five 1-hour Implementation Meetings with all staff to address MDFT implementation issues.

The social worker training used MDFT RCT therapist training methods. Trainers walked through the MDFT manual, played exemplar therapy videotapes, and taught staff how to apply aspects of what they were learning to ongoing cases. The social workers received the most training in quantity (30 hours) and depth of MDFT principles. The two social workers attended an additional total of 10 hours of individual supervision and 15 hours of supervision with their clients (co-therapy with trainers).

A 14-month Implementation phase followed the 6 months of formal training. During this phase, staff were expected to use the model, with regular supervision, co-therapy sessions, and booster training meetings with MDFT supervisors. Although formal training was complete, the Implementation phase involved facilitating provider change. Reading feedback about staff members' ability to implement new interventions was critical, and trainers adapted training and supervision according to staff feedback. A new therapist who had been hired approximately half-way into the Implementation phase attended a 2-day introductory training at the research

office, and received 6 hours of additional one-on-one booster training time during her first three months. MDFT trainers each spent 1 hour each per week in supervision with the two social workers during the Implementation phase (approximately). Whole staff Implementation and Clinical meetings (weekly 1 hour) were held throughout Implementation to problem solve MDFT incorporation challenges and prepare for the post-supervision Durability phase.

Assessments

Provider Practices

We examined clinical chart records and videotaped therapy sessions to determine the outcomes of the MDFT training on therapist behavior. The chart reviews recorded each case's weekly number and length of individual, parent, family, group, and extrafamilial therapeutic contacts. As part of the weekly chart review, Research Associates coded the progress notes for the therapy content focus (e.g., peers, school, family relationships). These content areas were aggregated for each adolescent who in turn received a score reflecting the proportion of sessions focused on each of the content themes as well as a score indicating the number of themes focused on each session. We were interested in examining the number of themes given MDFT's theoretical emphasis on addressing different aspects of the adolescent's psychosocial ecology and changing multiple interacting risk factors related to adolescent drug taking.

Observational methods documented therapist MDFT adherence within sessions. Across the three main study phases (Baseline, Implementation, and Durability), individual and family therapy sessions were videotaped every other week. 25% of cases in each study phase were then randomly selected for session rating using a revised version of the Therapist Behavior Rating Scale, a 29-item observational adherence coding system used in previous MDFT studies.¹² Raters judge the extensiveness of 29 interventions on a 7-item Likert-type scale from "not at all" to "extensive." The psychometric properties of the TBRS scales have been established in four studies. Five TBRS subscales were examined for therapist change from Baseline to Implementation and Durability: Overall MDFT Interventions (across therapeutic domains); Family-Focused Interventions (parenting and family relationship change); Adolescent-Focused Interventions (adolescent change); Parental Reconnection Interventions (engage and motivate parents in therapy); and Adolescent Engagement Interventions (increase teens' participation and engagement).

Twenty-eight cases were randomly selected for adherence ratings (10 from Baseline, 10 from Implementation, and 8 from Durability). One session between sessions 3 and 10 was randomly selected to be rated for each of these cases. Equal numbers of individual and family sessions

were sampled from each phase, and each clinician's sessions were sampled. The raters included a TBRS developer and TBRS developer-trained doctoral-level researcher. Therapy sessions were rated on the extensiveness of therapist adherence to MDFT interventions. The two raters demonstrated excellent inter-rater reliability (overall MDFT $ICC_{(1,2)} = .99$; Family Focus $ICC_{(1,2)} = 0.98$; Adolescent Focus $ICC_{(1,2)} = 0.94$; Parental Reconnection Intervention $ICC_{(1,2)} = 0.92$; Adolescent Engagement $ICC_{(1,2)} = 0.90$) using a subset of 3 sessions coded by both raters before coding study tapes independently.

Program Level Changes

A formal assessment of the treatment environment was also conducted with all clients at discharge assessment using the Community-Oriented Programs Environment Scale (COPEs).¹³ The COPEs is a 47-item scale that was used to evaluate five different dimensions of the treatment environment of the program. "Treatment Program" dimensions of Autonomy and Practical Orientation, and "System Maintenance" dimensions including Order and Organization, Program Clarity, and Staff Control, were measured.

Client Outcomes

All measures described below were administered at each of these assessment points. RAs successfully completed 98% of scheduled assessments at follow-up time points. Youth and parents were assessed separately by trained assessors who were blind to study hypotheses.

Background and Demographic Information

*Parent and Adolescent Interviews*¹⁴ gathered information on client demographics, family composition, other family member drug use, history of mental health and substance use problems, court involvement, treatment history, and school functioning.

Substance Use

The *Timeline Follow-Back Method*,¹⁵ a retrospective report of daily substance using a calendar (30-day period previous to assessment) and other memory prompts to stimulate recall, assessed substance use.

Urine screens were also conducted at each assessment point using the OnTrak TesTcup Pro5, an in vitro diagnostic test used for the qualitative detection of drug or drug metabolite⁵ in youths' urine. The Ontrak TesTcup Pro 5 profile (cutoff) consists of benzodiazepines (100 ng/ml), cocaine (300 ng/ml), methamphetamine (500 ng/ml), morphine (300 ng/ml) and THC (50 ng/ml).

Adolescent Emotional and Behavioral Symptoms

Parent report of adolescent symptoms was assessed with the Child Behavior Checklist.¹⁶ Broad band T-scores on the Internalizing scale (Withdrawn + Somatic Complaints + Anxious/Depressed scales) and

the Externalizing scale (Delinquent + Aggressive scales) were used as indicators of internalizing and externalizing symptoms. The adolescent's self report on their own symptoms was assessed with a parallel instrument, the Youth Self Report (YSR).

DATA ANALYSIS

Therapist Practice Patterns

We compared the average number of weekly individual and family therapy sessions, and weekly contacts with Department of Juvenile Justice (DJJ) and school personnel, across study phases using Analysis of Variance (ANOVA)-based *a priori* contrasts. First, the main effect for study phase was tested followed by *a priori* contrasts built into the study design and reflecting (1) the effectiveness of the training and (2) the durability of the training effects. We did not test all possible comparisons, but only the ones that were most pertinent to our hypotheses operationalized by contrasts reflecting: (1) Baseline vs. a combination of Implementation and Durability, and (2) Implementation vs. Durability. Because we limited the number of comparisons we tested to those directly related to our hypotheses, we used an alpha of .05 for each comparison. Some statisticians recommend against adjusting alpha when testing planned comparisons given that no agreed upon procedure exists and because useful findings may be ignored due to an overreliance on dichotomous decision rules. Research assistants coded charts for MDFT focus and session content. *A priori* contrasts were used to compare the proportion of sessions including MDFT themes, using the same contrast coding strategy. Finally, trained raters coded videotaped sessions using the TBRS. Again, *a priori* contrasts were used to compare study phases on the average adherence ratings using the same contrasts discussed previously.

Program Environment

ANOVA-based *a priori* contrasts were also used to compare adolescent ratings of the program environment using the same contrast coding strategy.

Treatment Outcomes

We examined changes in treatment outcomes among teens treated during the different study phases using latent growth curve¹⁷ (LGC) modeling methods implemented in the statistical software Mplus.¹⁸ Mplus is capable of analyzing change in both continuous and categorical (e.g., abstinence from substance use) outcomes. We used dummy coding to compare study phases (i.e., Baseline vs. Implementation and Baseline vs. Durability). LGC specifically examines individual client change and can accommodate missing data and individual variation in the outcome assessments schedule. Because discharge from the program depended on the youths' treatment progress and was therefore variable, we coded time as

weeks since the baseline assessment (admission to program). We hypothesized more improvement in client outcomes during the Implementation and Durability Phases than in the Baseline Phase.

RESULTS

Sample Differences over Study Phases

We examined and found no differences in the youth recruited over study phases on demographic characteristics such as age, gender, ethnicity, family structure or income. However youth recruited and treated during the Baseline phase were more likely to meet criteria for substance dependence than in Implementation and Durability [$\chi^2(1) = 6.31, p = .012$]. Additionally, a significantly greater proportion of youth met criteria for conduct disorder in Durability than Baseline and Implementation [$\chi^2(1) = 5.84, p = .016$].

Change in Therapist Practice Patterns

Table 1 shows the change in therapists' weekly individual and family therapy sessions, and contact with DJJ and school personnel. Results of the *a priori* contrasts indicated that therapists conducted more weekly sessions and extrafamilial contacts in Implementation and Durability than Baseline (Individual Sessions: $t(122) = -3.71, p < .001$; Family Sessions: $t(122) = -3.77, p < .001$; DJJ Contacts: $t(106) = -4.23, p < .001$; School Contacts: $t(106) = -3.08, p < .001$). With the exception of weekly individual sessions, no significant differences were noted in contacts between Implementation and Durability. Therapists increased the number of weekly individual sessions from Implementation to Durability ($t(122) = -2.35, p = .020$), indicating that overall these initial changes were sustained when trainers withdrew.

Regarding in-session content themes, therapists focused more exclusively on drug use in Baseline than in Implementation and Durability ($t(111) = 2.66, p = .010$), consistent with a traditional individual drug treatment program focus. However, consistent with MDFT's multiple-systems focus, therapists addressed adolescents' school problems to a greater extent in session during the Implementation and Durability Phases than in Baseline ($t(111) = -5.72, p < .001$). Additionally, therapists covered more MDFT themes per session during Implementation and Durability than in Baseline ($t(111) = -2.49, p = .014$), indicating that therapists expanded their focus in Implementation and Durability in accordance with MDFT guidelines. Because no differences were found in session themes between Implementation and Durability, support exists for the sustainability of these effects post-training.

We also rated videotaped therapy sessions in order to compare observational ratings of MDFT fidelity over the study phases. These analyses revealed that as expected, therapists executed more MDFT interventions

TABLE 1. Means, standard deviations, Omnibus *F* tests, and a priori contrast results for therapist practice patterns

Outcome measure	Study phase			Test statistics			
	Baseline	Implementation	Durability	Omnibus	Contrast	Contrast	Contrast
	M (SD)	M (SD)	M (SD)	<i>F</i>	coefficient 1 (SE)	coefficient 2 (SE)	<i>t</i>
Individual Sessions	0.49 (0.29)	0.63 (0.30)	0.81 (0.37)	10.91***	-0.46 (0.12)	-0.18 (0.08)	-2.35*
Family Sessions	0.18 (0.19)	0.28 (0.17)	0.35 (0.19)	8.46***	-0.27 (0.07)	-0.07 (0.04)	-1.62
Contacts with Juvenile Justice Personnel	0.20 (0.27)	0.54 (0.59)	0.66 (0.64)	4.23**	-0.80 (0.25)	-0.12 (0.13)	-0.93
Contacts with School Personnel	0.01 (0.02)	0.04 (0.06)	0.07 (0.13)	5.11**	-0.10 (0.02)	-0.03 (0.02)	-1.80
Drugs	0.65 (0.26)	0.48 (0.27)	0.52 (0.28)	2.80*	0.32 (0.13)	-0.04 (0.08)	-0.50
School	0.37 (0.30)	0.67 (0.25)	0.79 (0.18)	11.93***	-0.73 (0.13)	-0.13 (0.08)	-1.64
Peers	0.30 (0.29)	0.24 (0.22)	0.36 (0.25)	1.04	-0.01 (0.13)	-0.12 (0.08)	-1.47
Family	0.52 (0.30)	0.58 (0.28)	0.63 (0.25)	0.54	-0.16 (0.13)	-0.05 (0.08)	-0.57
Total # of MDFT Themes Addressed	3.34 (1.25)	3.89 (1.21)	4.06 (0.85)	7.02***	-1.26 (0.50)	-0.17 (0.31)	-0.04
Overall Adherence to MDFT	18.10 (4.72)	24.90 (8.52)	25.00 (10.57)	2.32	-13.70 (5.46)	-0.10 (4.58)	-0.02
Adherence to MDFT	3.70 (1.06)	6.56 (3.36)	6.38 (2.77)	1.88	-5.53 (2.02)	0.18 (1.23)	0.15
Adolescent Interventions	9.00 (2.49)	13.10 (6.35)	12.75 (5.97)	3.77*	-7.85 (3.31)	0.35 (2.91)	0.12
Family Interventions	5.00 (1.00)	7.60 (4.83)	8.50 (2.65)	1.43	-6.10 (2.69)	-0.90 (2.53)	-0.36
Parent Interventions	7.80 (2.62)	9.90 (3.11)	12.0 (5.48)	2.75	-6.30 (2.73)	-2.10 (2.17)	-0.97
Engagement Interventions	3.80 (3.22)	2.70 (1.64)	4.63 (2.13)	1.41	0.28 (1.93)	-1.93 (1.16)	-1.66
Extensiveness of Drug Counseling Interventions	10.60 (3.13)	10.70 (4.60)	9.25 (2.38)	0.44	1.25 (2.60)	1.45 (1.69)	0.86
Extensiveness of Cognitive-Behavioral Therapy Interventions							

Note. Contrast 1 refers to baseline vs. implementation and durability. Contrast 2 refers to implementation vs. durability. M = Mean, SD = Standard Deviation, SE = Standard Error. **p* < .05, ***p* < .01, ****p* < .001.

in the Implementation and Durability Phases than in the Baseline phase of the study ($t(25) = -2.51, p = .020$; see Table 1). Examination of the TBRS subscales indicated these increases in MDFT adherence applied to MDFT family-focused interventions ($t(25) = -2.37, p = .02$), adolescent-focused interventions ($t(25) = -3.39, p = .003$), engagement interventions ($t(25) = -2.31, p = .03$), and Parental Reconnection Interventions ($t(25) = -2.27, p = .05$). Also consistent with expectations, following MDFT training there were no phase differences in either the use of drug counseling interventions ($t(25) = 0.12, p = .904$) or cognitive behavioral interventions ($t(25) = 0.48, p = .636$). Overall, these results indicated that therapists reliably changed their usual style of work with adolescents by among other things, conducting more parent and family work in ways that were consistent with MDFT parameters, principles, and techniques.

Change in Program Environment

Youth also reported reliable differences in 4 of the 5 program environment dimensions examined over the study phases (see Table 2). Results indicated that adolescents perceived the program environment to be more controlled in Implementation and Durability ($t(100) = -3.16, p = .002$) than in Baseline. Further, adolescents reported more control in Durability than in Implementation ($t(100) = -4.21, p < .001$), suggesting that the program continued to improve on this dimension even after MDFT experts withdrew. In Implementation and Durability, clients reported that staff had a more practical and useful orientation to their problems ($t(100) = -2.00, p = .048$) and more clarity of program expectations was communicated ($t(100) = -2.06, p = .042$) than what was reported by Baseline phase youth. However, positive changes in staff clarity declined between Implementation and Durability phases ($t(100) = -2.78, p = .008$). Finally, youth reported having more autonomy ($t(100) = 2.76, p = .007$) in Implementation than in Durability.

Change in Client Outcomes

We examined phase differences in client change (from intake to 9 mo. follow-up) on the following outcome measures: (1) proportion abstaining from drug use in the previous 30 days (client self-reports and biological urine assays), (2) drug use frequency over the previous 30 days, (3) internalizing and externalizing symptoms, and (4) proportion in out-of-home placements after program release. Preliminary analyses on these outcome variables using LGC modeling indicated that change was represented best as linear, as opposed to quadratic or piecewise change. Because youths' drug use reports are influenced by their access to drugs, we included their placement status (in or out of home) as a covariate in all outcome analyses. Because time in treatment varied over participants ($M = 15.17, SD = 9.67$), weeks in treatment was included as a covariate. Therefore, any statistically significant findings reflect phase differences above what could be explained by the participants being in a controlled environment and their number of weeks in treatment.

Substance Use

Table 3 shows the LGC modeling results. Results indicated that a greater proportion of youth across phases reported abstaining from drugs at the 9 month follow-up than at the intake assessment (slope estimate = -0.13 , pseudo $z = -2.59, p < .01$). Considerable heterogeneity among the participants is demonstrated by a non-significant but marginal trend for the variance estimate (variance estimate = 0.12 , pseudo $z = 1.82, p < .10$). After fitting the overall growth across all participants, we examined differences between study phases. At intake, youth receiving treatment in the Durability phase were more likely to report using drugs in the previous 30 days than those treated during the Baseline phase (intercept estimate = 2.98 , pseudo $z = 3.53, p < .001$). However, over the 9 month follow-up, a larger proportion of youth reported abstaining from drugs in both the Implementation (slope estimate = -0.30 , pseudo $z = -2.31, p < .05$) and Durability phases (slope estimate = -0.52 , pseudo

TABLE 2. Means, standard deviations, and a priori contrast results for program environment

Program environment dimension – COPES subscale	Study phase			Test statistics					
	Baseline	Implementation	Durability	Omnibus	Contrast	Contrast			
	M (SD)	M (SD)	M (SD)	F	coefficient 1 (SE)	t	coefficient 2 (SE)	t	
Autonomy	4.30 (1.46)	4.70 (1.26)	3.64 (1.73)	2.60	0.27 (0.72)	0.38	1.05 (0.38)	2.76***	
Practical orientation	5.35 (2.10)	6.00 (1.69)	6.68 (2.20)	2.05	-1.98 (0.99)	-2.00*	-0.68 (0.52)	-1.29	
Order and organization	5.91 (1.98)	6.94 (1.65)	6.18 (2.42)	1.57	-1.29 (0.95)	-1.35	0.76 (0.51)	1.50	
Clarity	5.39 (1.75)	6.61 (1.36)	5.79 (1.83)	2.81*	-1.62 (0.79)	-2.06*	0.83 (0.42)	2.78**	
Control	6.96 (1.66)	7.26 (1.29)	8.71 (1.08)	9.32***	-2.06 (0.65)	-3.16**	-1.46 (0.35)	-4.21***	

Note. Contrast 1 refers to Baseline vs. Implementation and Durability. Contrast 2 refers to Implementation vs. Durability.

M = Mean, SD = Standard Deviation, SE = Standard Error.

* $p < .05$, ** $p < .01$, *** $p < .001$.

TABLE 3. Means and standard errors for growth factors and phase differences on outcome reports

Outcome measure	Growth factor mean				Baseline vs. implementation difference				Baseline vs. durability difference			
	Intercept		Slope		Intercept		Slope		Intercept		Slope	
	Estimate (SE)	Variance (SE)	Estimate (SE)	Variance (SE)	Estimate (SE)	Variance (SE)	Estimate (SE)	Variance (SE)	Estimate (SE)	Variance (SE)	Estimate (SE)	Variance (SE)
Substance use vs. No use self-report	0 ^a (N/A)	6.74** (2.60)	-0.13** (0.05)	0.12 (0.07)	1.23 (0.73)	3.46* (1.79)	-0.30* (0.13)	0.03 (0.05)	2.98*** (0.87)	3.21 (1.77)	-0.52*** (0.11)	0.01 (0.01)
Substance use vs. No use urinalysis	0 ^a (N/A)	52.75*** (25.01)	-0.02 (0.11)	0.60* (0.30)	1.03 (1.72)	46.38* (23.19)	-0.74* (0.30)	0.49 (0.27)	16.99*** (4.78)	34.16 (16.58)	-1.71*** (0.54)	0.35 (0.19)
Parent reported externalizing	66.74*** (1.63)	263.12*** (39.99)	-0.78*** (0.21)	1.64 (0.96)	-2.06 (3.48)	135.15*** (35.38)	-0.22 (0.45)	1.10 (0.97)	0.17 (4.30)	195.92*** (46.24)	-1.23* (0.51)	1.98 (1.79)
Parent reported internalizing	58.08*** (1.34)	189.22*** (31.42)	-0.45** (0.17)	1.89** (0.75)	2.11 (2.92)	157.50*** (33.73)	-0.62 (0.41)	1.50 (0.79)	4.61 (3.95)	107.73*** (29.66)	-1.53** (0.49)	1.43* (0.70)
Youth reported externalizing	53.67*** (1.04)	107.29*** (15.61)	-0.38*** (0.11)	0.78** (0.30)	2.81 (2.65)	88.52*** (20.47)	-0.17 (0.26)	0.46 (0.25)	4.65 (2.81)	85.32*** (17.01)	-0.29 (0.25)	0.48 (0.38)
Youth reported internalizing	48.92*** (0.92)	86.26*** (19.71)	-0.28* (0.11)	0.75*** (0.24)	-1.61 (2.39)	87.17** (31.72)	-0.10 (0.27)	0.82** (0.32)	2.54 (2.78)	95.64** (35.01)	-0.74** (0.28)	0.52 (0.40)

Note. Baseline vs. implementation and baseline vs. durability difference refers to mean differences in growth parameters between the respective study phases. Intercept refers to intake values; slope refers to change over 9-month follow-up.

SE = Standard error.

^a Value fixed for model identification, necessary for fitting latent growth curve models with categorical outcomes.

* $p < .05$, ** $p < .01$, *** $p < .001$.

$z = -4.55, p < .001$) than clients treated in Baseline. Client self-reports of their use were corroborated with urine screens, which revealed the same pattern of results (Baseline vs. Implementation: slope estimate = -0.74 , pseudo $z = -2.54, p < .05$; Baseline vs. Durability: slope estimate = -1.71 , pseudo $z = -3.17, p < .01$). These phase differences in abstinence were not reflected in frequency of use, as there were no reliable differences between either Baseline and Implementation (slope estimate = 0.01 , pseudo $z = 0.13, ns$) or Baseline and Durability (slope estimate = $0.02, t = 0.45, ns$) on youths' reports of days used.

Post-Treatment Out of Home Placement

We examined whether rates of clients' out-of-home placements following treatment in the day treatment program were reduced among clients after MDFT training and implementation. We examined the proportion of participants living outside their homes at the 9 month follow-up using a χ^2 test of independent samples (study phase by out of home placement status). Results showed that Baseline participants were significantly more likely to be placed outside the home at the 9 month follow-up than they were in Implementation ($\chi^2(1) = 8.83, p = .003$) or Durability ($\chi^2(1) = 10.56, p = .001$). Specifically, 37% of Baseline, 8% of Implementation, and 3% of Durability youth were living in out of home placements at the 9 month follow-up assessment.

Externalizing and Internalizing Symptoms

We observed change in both parent and teen-reported internalizing and externalizing behaviors. Overall time effects were significant for *parent-reported* externalizing behaviors (slope estimate = -0.78 , pseudo $z = -3.75, p < .001$), *youth-reported* externalizing behaviors (slope estimate $b = -0.38$, pseudo $z = -3.65, p < .001$), *parent-reported* internalizing behaviors (slope estimate $b = -0.45$, pseudo $z = -2.70, p < .01$), and *youth-reported* internalizing behaviors (slope estimate $b = -0.28$, pseudo $z = -2.56, p < .01$). These time effects were significant within each study phase. Likewise, each of the outcome variables demonstrated substantial heterogeneity across individuals as demonstrated by statistically significant variance estimates or marginal trends (parent-reported externalizing: variance estimate = 1.64 , pseudo $z = 1.71, p < .10$; parent-reported internalizing: variance estimate = 1.89 , pseudo $z = 2.53, p < .05$; youth-reported externalizing: variance estimate = 0.78 , pseudo $z = 2.64, p < .01$; youth-reported internalizing: variance estimate = 0.75 , pseudo $z = 3.13, p < .01$).

Concerning differences between study phases (see Table 3), LGC modeling results indicated that Durability participants decreased their *parent-reported* externalizing behaviors more rapidly than Baseline participants (slope estimate = -1.23 , pseudo $z = -2.40, p < .05$) Baseline-Implementation differences were not statistically

significant (slope estimate = -0.22 , pseudo $z = -0.49, ns$). With respect to *youth-reported* externalizing symptoms, there were no differences between study phases (Baseline vs. Implementation: slope estimate = -0.17 , pseudo $z = -0.62, ns$; Baseline vs. Durability: slope estimate = -0.29 , pseudo $z = -1.15, ns$). For internalizing symptoms, both parent and adolescent reports indicated that youth improved more rapidly in Durability than Baseline (YSR: slope estimate = -0.74 , pseudo $z = -2.65, p < .01$; CBCL: slope estimate = -1.53 , pseudo $z = -3.12, p < .01$). Baseline-Implementation differences were not significant (YSR: slope estimate = -0.10 , pseudo $z = -0.36, ns$; CBCL: slope estimate = -0.62 , pseudo $z = -1.52, ns$). In the main youth in the Durability Phase improved more dramatically in terms of emotional and behavioral problems than those in the Baseline phase.

Subgroup Analyses

In examining whether the demographic variables of adolescent gender and ethnicity (Hispanic vs. other ethnicities) acted as between-subjects covariates, we found no significant between-groups differences.

DISCUSSION

Changes in staff behavior. Therapist behavior changed significantly during and after MDFT training. Different data sources, including case records, therapist notes and therapist behavior as rated in session videotapes, consistently show adherence after training and over time to MDFT interventions in sessions. MDFT adherence was also found more generally in the number of individual and family sessions conducted, and increased school and juvenile justice interventions. The barriers to changing clinician behavior in technology transfer efforts were targeted directly and in many ways overcome as evidenced by the findings on sustained observable changes in provider practices. Clinicians' range of interventions expanded to include methods (e.g., family focused interventions, focused targeting of parenting practices) that are linked to favorable youth outcomes in earlier MDFT studies. We understand these outcomes on the basis of the successful establishment and maintenance of the training relationships (important in training and in therapy), the consistency, constancy and organization offered in the training/technology transfer intervention, and also on the basis of the capacity to emphasize elements of the MDFT approach that were syntonetic with expressed program and provider needs. Thus, although the program initially said they worked with parents, little family contact and family work occurred. The training presented a rationale, set of practical methods for working with families and other important systems in the youth's life, and a framework to practice and gain skill in this new approach. Another critical ingredient in the change process

was the supervision of the clinicians' actual clinical work with program cases. Supervision focused on the critical aspects of therapist change, including therapist clinical style, and presented weekly feedback in areas as diverse as case conceptualization and clinical method. Another aspect of how we account for the clinician change process includes not only how therapists incorporated new strategies and techniques, but also how certain interventions, such as a drug counseling focus (i.e., methods that were both core to their current practices and consistent with the MDFT approach) were maintained. The issue of maintaining the continuity of some program/provider practices while at the same time, incorporating new program features or intervention variations remains an interesting and important dimension of the technology transfer process.

Changes in program structure. Incorporation of MDFT included various positive program changes, including greater staff clarity, control, and practical problem solving orientation to the youths' difficulties. The technology transfer intervention addressed multiple systems and sources of influence that make adoption of evidence based practices difficult. Although implementation science experts recommend a comprehensive, systemic approach in transporting empirically supported therapies to agency regular practice, it is not yet known which aspects of the host environment are most amenable or difficult to change. For example, we do not know which program factors are most important to change when the goals include the incorporation of new practices as well as enhancement of clinical outcomes. During Durability, staff continued the clinical implementation meeting that began at the end of the Training period. This meeting remained productive in refining MDFT learning and incorporation.

Changes in adolescent outcomes. Adolescent outcomes were improved and sustained in several but not all targeted areas. Abstinence from drug use, parent report of externalizing problems, youth and parent reported internalizing problems, and out of home placements (after program discharge) all changed significantly after MDFT's introduction. The cost/economic significance of the out of home placement reduction is noteworthy given the need for treatments that have both ecological validity and potential to produce policy influencing outcomes. At the same time, no differences in frequency of drug use or youth report of externalizing problems were found. The strongest findings of the present study involve changes that were in provider behavior and clinical outcomes, changes that were sustained after the MDFT personnel were no longer involved in the program.

Study limitations should be noted. Although an interrupted time series design is a widely known and highly regarded,¹⁹ the study did not use a randomized design. Second, although we made every effort to ensure the program's representativeness so as to maximize the study's generalizability, this design used a single drug treatment

setting and the staff that were employed at that setting as the sole locale of the technology transfer effort. Third, we elected not to adjust alpha for multiple comparisons because the contrasts were built into the research design *a priori*. Findings relating to some of the changes observed in the program environment (specifically involvement, practical orientation to the youths' problems, and clarity of staff expectations) may be subject to inflation of Type I error. Therefore, replication of these findings is needed. We are currently conducting a study designed to replicate and extend these findings with a larger cohort of treatment agencies.

The study has several strengths as well. We developed a technology transfer intervention framework that paralleled, and indeed used, aspects of our therapy intervention framework. Thus we have articulated a theory-based, testable and replicable framework as well as a way of developing further technology transfer intervention models. The design included outcome assessments with multiple participants, in multiple outcome domains (including behavioral ratings of actual provider behavior to test MDFT technique and skill acquisition), and, to test sustainability of the technology transfer intervention, assessments across several time points.

The study's findings have implications in three areas. First, we found that an established evidence-based practice for teen drug abuse, Multidimensional Family Therapy, could be transported to a type of clinic setting of continued import for the field – a day treatment, intensive outpatient treatment program for drug using, and mostly juvenile justice involved adolescents. Second, the findings support the continued development and dissemination promise for MDFT, a treatment system that has been adapted and shown to have positive outcomes in symptom removal in target domains such as drug taking, and affiliation with deviant peers, as well as protection-enhancing outcomes in areas such as parenting and family environment and school outcomes, with a range of adolescents (ages, ethnicities, geographic locales) and settings (non-research clinical settings). Finally, the study offers evidence for the multi-level and multi-domain effectiveness, including changes in staff behavior, program functioning, and client outcomes, of a well-defined, theory-based dissemination strategy that uses change principles and methods from the very therapy approach it attempts to teach.

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