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Drug Use Trajectories After a Randomized Controlled Trial of MTFC: Associations With Partner Drug Use

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Trajectories of drug use were examined in a sample of women with prior juvenile justice system involvement. One hundred fifty-three young women who participated in a randomized controlled trial of Multidimensional Treatment Foster Care (MTFC) in adolescence were assessed on five occasions over a 24-month period in young adulthood (mean age = 22.29 years at T1). Participants assigned to the MTFC condition during adolescence reported greater decreases in drug use than girls assigned to the treatment-as-usual (TAU) condition. Partner drug use was significantly associated with women's concurrent drug use, although participants in the MTFC condition were more resilient to partner drug use than in the TAU condition. Implications for drug use prevention and intervention programs during adolescence are discussed.

In 2011, an estimated 22.5 million Americans were illicit drug users (Substance Abuse and Mental Health Services Administration [SAMHSA], 2012). Despite the consequences and high costs of drug use and abuse (e.g., incarceration and higher healthcare utilization; National Drug Intelligence Center [NDIC], 2011), and the markedly high rates of substance use within justice system populations (National Institute on Drug Abuse [NIDA], 2006), there is little prospective longitudinal research on drug use for women who were involved in the juvenile justice system. It is therefore unclear whether drug use in this high-risk population increases, decreases, or remains stable during young adulthood. In addition, although family-based interventions are effective at reducing problem behaviors in high-risk adolescents (Henggeler & Sheidow, 2012), the efficacy of family-based interventions, and how these interventions and other social relationships interact, in reducing women's drug use during young adulthood, is unknown. The current study reduces these gaps in the literature by examining trajectories and predictors of drug use over a 2-year period during young adulthood in a sample of women with juvenile justice histories who participated in a randomized controlled trial of Multidimensional Treatment Foster Care (MTFC) during adolescence.

Data from the 2011 National Survey on Drug Use and Health (SAMHSA, 2012) indicate that the prevalence of illicit drug use increases during adolescence to a peak at age 18–20 and then declines in older age groups. Consistent with an age-graded theory of informal social control (Sampson & Laub, 1993), the increasing responsibilities and social role changes that coincide with the transition to adulthood are likely to be associated with decreased drug use during this developmental period, as new social roles (e.g., spouse, parent, and employee) become less compatible with drug use (Austin & Bozick, 2012; Fergusson, Boden, & Horwood, 2012; Hamil-Luker, Land, & Blau, 2004), and as increasing maturation of impulse control and future orientation lessen the attractiveness of drug use or other antisocial behaviors over this transition period (Keating, 2004). From a practical standpoint, the number of hours spent at a place of employment, in a higher education environment, or engaging in caregiving activities reduces exposure to more antisocial environments, thereby reducing opportunities for drug use.

However, it is not clear whether high-risk populations such as women who have been involved in

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the juvenile justice systems would show similar decreased drug use trajectories during young adulthood (Bachman et al., 2002; Broidy et al., 2003). Rates of drug use are higher in juvenile and adult criminal justice system populations than in community samples. In 2011, 26.5% of adults on parole or supervised release and 28.5% of those on probation were current illicit drug users, as compared to 8.4% of adults who were not on parole or supervised release and 8.2% of adults who were not on probation (SAMHSA, 2012). For women in the justice system, a study of 240 parolees found that more than two thirds of the sample experienced disruption of their lives due to alcohol use and more than a third required alcohol dependence treatment (Brown, 2006). In a previous report with the sample used in the current study, approximately 40% of the women with juvenile justice histories were using marijuana and about one third were using other illicit drugs in young adulthood (Leve, Kerr, & Harold, 2013).

In relation to *trajectories* of drug use during young adulthood, research using a high-risk sample of men found increases in drug use until approximately age 19–22 years, with subsequent decreases in use over time (Kerr, Capaldi, Owen, Wiesner, & Pears, 2011). In another sample of boys and girls in the juvenile justice system, the prevalence of substance use disorders generally decreased over time during adolescence and young adulthood (age at baseline = 10–18 years; age at final follow-up assessment = 15–23 years); these decreases were more pronounced for women than for men (Teplin, Welty, Abram, Dulcan, & Washburn, 2012). Another study using a community sample (Casswell, Pledger, & Pratap, 2002) found that although women in their study tended to evidence increased alcohol use (quantified as amount of alcohol consumed per drinking occasion) until age 21, with declines after age 21, a subset of the sample continued to increase their alcohol consumption per occasion from age 21 to 26 years. Thus, the limited research on trajectories of drug use across adolescence and young adulthood has typically indicated that use declines after age 21 or 22.

Social Relationship Influences on Drug Use

Social relationships, including parent–child and romantic relationships, appear to be especially salient influences on drug use during adolescence and young adulthood. The relative salience and influence of social relationships likely evolve over time, with romantic relationships becoming more influential during late adolescence and young adulthood (Fincham & Cui, 2011). For women, more so than men, there is evidence for strong romantic partner influences on deviance and substance use (Haynie, Giordano, Manning, & Longmore, 2005; Mezzich et al., 1997). In addition, the persistence of antisocial behavior into young adulthood (past age 21) for young women has been shown to occur more often among women with antisocial partners (Moffitt, Caspi, Rutter, & Silva, 2001). It is therefore crucial to examine the influences of romantic partners on the course of drug use during young adulthood.

Romantic relationships appear to be a particularly salient aspect of the social environment for drug use in girls involved with juvenile justice system, as adolescents are often introduced to and become involved in illicit drug use through their significant others (Bright & Jonson-Reid, 2010; Bright, Ward, & Negi, 2011; Brown, 2006). Additionally, studies have indicated that those who use drugs are likely to have romantic partners who display similar levels of drug use (Low, Cui, & Merikangas, 2007; Merline, Schulenberg, O'Malley, Bachman, & Johnston, 2008). Further, consistent with a "snares" hypothesis (Hussong, Curran, Moffitt, Caspi, & Carrig, 2004), romantic partner drug use during young adulthood might interfere with the normative decreases in young women's drug use typically observed during this developmental period. Adolescent girls who report engaging in high levels of delinquent behaviors also report that they are pressured toward more antisocial behaviors by their romantic partners (Cauffman, Farruggia, & Goldweber, 2008), implicating the potential role of partner drug use on her own drug use.

The Multidimensional Treatment Foster Care Model for Delinquent Adolescents

Early parent–child relationships exert a long-lasting influence on adaptive functioning in adulthood (Englund, Kue, Puig, & Collins, 2011). In addition, the quality of parent–child relationships is associated with the quality of romantic relationships in late adolescence and young adulthood (Simpson, Collins, Tran, & Haydon, 2007). Moreover, adaptive functioning and the family environment predict change in substance use during adolescence (Sullivan & Farrell, 1999) and having a romantic partner who does not use, or uses less, reduces the likelihood of use during young adulthood (Kim, Tiberio, Pears, Capaldi, & Washburn, 2013). In light

of this, we expect that improvements in the parent–child relationship and family functioning during adolescence may result in decreased drug use over time in concert with romantic relationships during young adulthood. We therefore examined the effect of a family-focused intervention delivered during adolescence on drug use trajectories during young adulthood. Multidimensional Treatment Foster Care (MTFC) has received national attention as a cost-effective alternative to residential care for adolescents (Aos, Phipps, Barnoski, & Lieb, 2001; Chamberlain, 2003). MTFC involves placing youths individually in well-trained and supervised foster homes. Close consultation, training, and support of the foster parents are the cornerstones of MTFC. Program supervisors with small caseloads (10 families each) maintain daily contact with MTFC parents to collect data on youth adjustment and to provide ongoing consultation, support, and crisis intervention. The MTFC intervention embodies a strong focus on strength-building and positive reinforcement, and specific treatment services are tailored to the youth's age and developmental level. Details about the components of MTFC are described in greater detail in the methods section.

Previous studies have demonstrated that MTFC is effective at improving both delinquency-related outcomes (i.e., criminal referrals, days in locked settings, self-reported delinquency, and deviant peer affiliation; Chamberlain, Leve, & DeGarmo, 2007; Leve, Chamberlain, & Reid, 2005) and other relevant outcomes (pregnancy, school attendance, homework completion, and depression; Harold et al., 2013; Kerr, Leve, & Chamberlain, 2009; Leve & Chamberlain, 2007) in girls referred from the juvenile justice system. However, whether these treatment effects extend to illicit drug use and the extent to which contemporaneous influences (e.g., romantic partner drug use) are associated with these young women's drug use during the transition to young adulthood has not been tested.

There are theoretical reasons to expect that the family processes targeted by MTFC are likely to influence girls' and young women's drug use during adolescence and through the transition to young adulthood. Parental monitoring, a key component of MTFC, is consistently associated with adolescent drug use (Bohnert, Anthony, & Breslau, 2012; Lee, 2012; Martins, Storr, Alexandre, & Chilcoat, 2008; Tobler & Komro, 2010). Similarly, the therapy and individual skills training components provided to the girls in MTFC include a focus on motivational interviewing, identifying high-risk situations for use, refusal skills, and selecting appropriate friends, all of which are likely to improve girls' ability to navigate situations in which drug use is likely. In addition, programs such as the Strengthening Families Program (SFP; Kumpfer, Alvarado, Tait, & Whiteside, 2007) that target similar family and skill-based processes targeted in MTFC have shown promising effects in preventing drug use in youth. There is also evidence to indicate that drug use prevention programs administered during adolescence can have lasting effects on drug use into young adulthood (Riggs, Chou, & Pentz, 2009).

The Current Study

The goals of the current study are to examine (1) the course of drug use during young adulthood in a sample of women with prior juvenile justice system involvement; (2) effects of MTFC delivered during adolescence on drug use trajectories in young adulthood (age 16–29 at the first young adult assessment); and (3) associations and interactions between participants' and romantic partners' drug use over time. Although we expected to see declines in participant drug use during young adulthood based on the Kerr et al. (2011) and Teplin et al. (2012) studies, it was also possible that, given the at-risk characteristics of the sample (Leve et al., 2013), they would show stable use or increasing use over time, similar to that seen in a subset of the Casswell et al. (2002) sample. We hypothesized that participants who were randomly assigned to the MTFC condition during adolescence would report greater decreases in drug use during young adulthood than would participants who were assigned to the treatment-as-usual condition (TAU; placement in group care). We further hypothesized that partner drug use would be significantly associated with concurrent drug use at each young adult assessment occasion, even after accounting for intra-individual trajectories of drug use during young adulthood, and that intervention assignment would interact with partner drug use, such that women in the MTFC condition would be less influenced by their partners' drug use than women in the TAU condition.

METHOD

Participants

In the original study, two cohorts of adolescent girls participated in a randomized controlled trial between 1997 and 2006 to contrast MTFC and out-

of-home TAU (group care) services in Oregon (N = 166; ns = 81 and 85 for cohort 1 and 2, respectively). The girls had been court mandated to community-based, out-of-home care because of problems with chronic delinquency. In the original study, we attempted to enroll all referred girls (N = 251 eligible girls) who were 13–17 years of age, who had at least one criminal referral in the prior 12 months, who were not currently pregnant, and who were placed in out-of-home care within 12 months following referral. Of these 251 eligible girls, 166 met inclusion criteria and agreed to participate in the study (see Figure 1). The project coordinator randomly assigned enrolled girls to either MTFC (n = 81) or TAU (n = 85). All youths and caregivers were aware that they were participants in a research study and that they were receiving treatment services. The girls were 13–17 years old at the baseline assessment (M = 15.31, SD = 1.17).

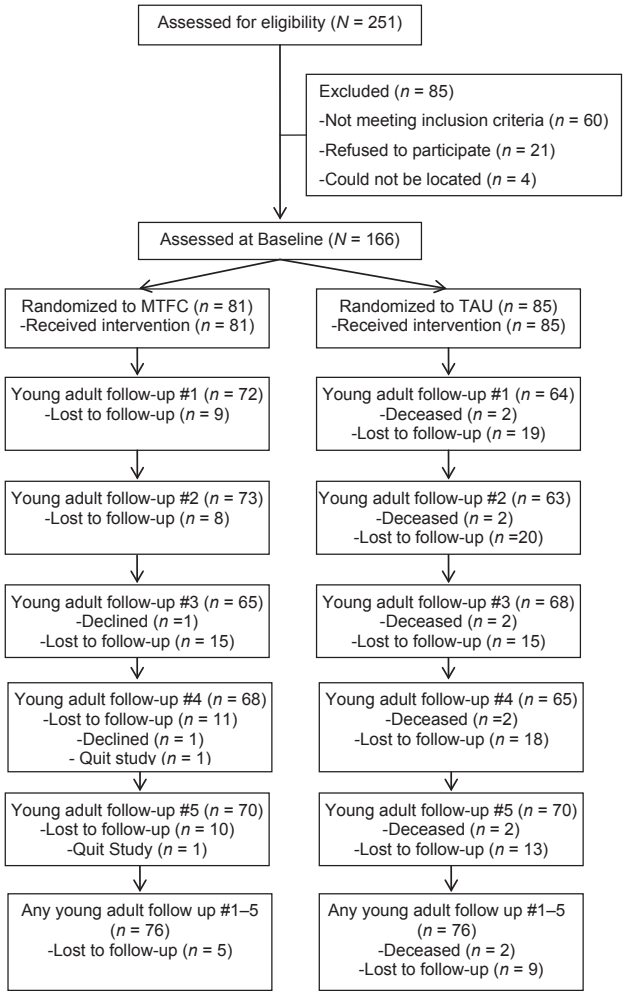

FIGURE 1 Consort diagram.

In the current study, we attempted to re-enroll all 166 young women who participated in the original study; 152 of them (93%) participated in at least one of the five young adult assessments (T1–T5); two of the original study participants were deceased; the remaining 12 could not be located or refused to participate. Eighty-three percent of the original participants were assessed at T1, 83% at T2, 81% at T3, 82% at T4, and 85% at T5. Sixty-three percent of the original participants were assessed at all five assessments; 16% participated in 4 of 5 assessments, 7% in 3 of 5, 4% in 2 of 5, and 2% in 1 of 5. Comparisons of participants who could not be located or declined to participate at any of the young adult follow-up assessments (7% of the total sample) to those who participated during at least one follow-up assessment indicated that they *did not differ* on baseline drug use, days in treatment, intervention assignment, cohort, or ethnicity (all ps > .10). The only significant difference was that those who did not participate were more likely to have been in cohort 1 versus cohort 2 ($p < .05$). Of those participants who participated at the corresponding time point, 85% provided information on a romantic partner at T1; 87% at T2; 78% at T3; 82% at T4; and 79% at T5. Overall, 75% of the full sample of 166 potential participants reported information about a partner during at least one young adult assessment (82% of the 152 who participated in the young adult assessments). There was variability in the type (e.g., dating, cohabiting, married) of partnerships and not all participants reported on the same partner at each assessment. At T1, 14% of the participants with partners reported being married, 39% were cohabiting, and the remaining participants with partners (47%) represented dating relationships. Comparisons of participants who did not provide information about a partner at any of the young adult assessments to those who provided such information during at least one follow-up assessment indicated that they did not differ on baseline drug use, days in treatment, intervention assignment, cohort, ethnicity, drug use at any of the young adult assessments, or drug use onset (all ps > .10). Participants who did not provide information on a partner at any young adult assessment were, on average, younger at T1 than those who did report on a partner during at least one young adult assessment, $t(134) = -3.72$; $p < .001$; M = 20.62, SD = 2.89 and M = 22.84, SD = 3.06, respectively.

The first young adult follow-up interview occurred, on average, 6.96 years (SD = 2.93) post-baseline. The average age of participants at the first

young adult follow-up assessment was 22.29 years (*SD* = 3.16; age ranged from 16 to 29 at T1). The young adult assessments are currently ongoing every 6 months; this study utilizes data from the first five completed young adult interviews. The assessment that occurred prior to random assignment to intervention condition will be referred to as *baseline*. The ethnic breakdown of participants was as follows: 68.1% Caucasian, 1.8% African American, 11.4% Hispanic, 0.6% Native American, 0.6% Asian, 16.9% mixed ethnic heritage, and 0.6% reported other or unknown ethnicity. We report ethnicity for both cohorts as reported by participants at the first young adult assessment; note that these percentages differ slightly from those in previously published reports on this sample due to the self-report (vs. caregiver report) nature of the data used here. In comparison, 93% of the girls 13–19 years of age living in the region during the recruitment period for the original study were Caucasian (U.S. Department of Commerce, 1992). This sample is fairly comparable in ethnicity to the female juvenile justice population nationwide, which at the time of the recruitment period ranged from 63.3% to 67.9% Caucasian (Puzzanchera & Kang, 2011). Prior to the baseline assessment, participants reported an average of 2.18 (*SD* = 3.46) previous out-of-home placements. There were no significant mean differences on the average number of out-of-home placements for girls randomly assigned to MTFC (*M* = 2.17, *SD* = 2.79) vs. TAU (*M* = 2.20, *SD* = 4.02); *t* (151) = .04; *p* = .97.

Adolescent Intervention: MTFC and TAU Conditions

Girls in the MTFC condition were individually placed in 1 of 22 highly trained and supervised homes with state-certified foster parents. Experienced program supervisors with small caseloads (i.e., 10 MTFC families) supervised the clinical staff, coordinated aspects of each youth's placement, and maintained daily contact with the MTFC parents. The intervention was individualized but included all basic MTFC components: daily telephone contact with foster parents to monitor case progress and program adherence; weekly group supervision and support meetings for foster parents; an in-home, daily point-and-level behavior management program for girls; individual therapy for girls; weekly meetings with behavioral support specialists in community settings; family therapy for the aftercare placement family (usually the biological family) focused on parent management strategies; close monitoring of school attendance, performance, and homework completion; case management to coordinate the interventions; 24-hr on-call staff support for foster and aftercare parents; and psychiatric consultation as needed. In the second cohort, MTFC also included components specifically targeting substance use (e.g., motivational interviewing and incentives for clean urinalyses) and risky sexual behavior (e.g., information on sexual behavior norms and education and instruction about strategies for being sexually responsible). Girls assigned to the MTFC condition remained in their MTFC placement for an average of 196 days (*SD* = 158.20).

Girls in the TAU condition were placed in 1 of 35 community-based programs in Oregon, the majority of which were group care facilities. The TAU programs represented typical services for girls referred to out-of-home care by the juvenile justice system. The program philosophies were primarily eclectic (61.5%) or behavioral (38.5%); 80% of the programs reported delivering weekly therapeutic services. Note that these numbers differ from those reported in previously published reports of this sample because prior reports included only cohort 1 and reported on the program philosophies for MTFC and TAU combined. Girls assigned to TAU remained in their placement for 153 days on average (*SD* = 131.86). The difference in days of treatment for MTFC versus TAU girls was not statistically significant, $t(151) = -1.828$; $p = .07$. Because treatment was individualized in both conditions and because the intervention setting (24/7 individual foster care placement vs. 24/7 group care facility) is an active agent of the intervention, we conceptualize intervention dosage based on the number of days participants resided in their intervention setting.

Measures

Young women's illicit drug use. At each young adult interview (T1–T5), young women were asked to report the frequency with which they used illicit drugs, including stimulants, hallucinogens, opiates, inhalants, depressants, and club drugs in the past 6 months. Participants were asked about their frequency of drug use separately for each drug class. For example, participants were asked the number of times they used opiates in the past 6 months. The number of times participants used each drug class was recorded separately. Overall use of illicit drugs was then calculated by summing the number of times the girls' reported using a particular

class of illicit drug during the past 6 months across all drug classes and that total was placed on a Likert-type scale ranging from 1 = (*never* [0 *times*]) to 5 (*one or more times per day* [180 + *times*]). For example, if a participant reported using inhalants 80 times in the past 6 months and opiates 123 times in the past 6 months, her overall drug use frequency would be 203 times and would be assigned a score of 5, indicating drug use at least 180 times in the past 6 months. This procedure is similar to that used in the Monitoring the Future study and has been used extensively in published reports (e.g., Johnston, O'Malley, & Bachman, 2001; Leve et al., 2013). As it was not expected that the frequency of use for one particular drug would necessarily be associated with the frequency of use for any other drug, we did not examine the internal consistency of responses for individual drug classes. Drug use demonstrated sufficient variability at each assessment occasion (scores ranged from 1 to 5 at each assessment; see Table 1 for means and *SD*).

Partner illicit drug use. Participants were asked at T1–T5 if they were currently involved with or seeing anyone, and if they had had any other romantic relationships in the last 6 months. The definition of "partner" was presented to participants as "including people you have dated, and relationships which have been physically or emotionally intimate, during the last 6 months." Partner drug use was then obtained from participants' responses at T1–T5 to one question about the frequency of partner use of illicit drugs including stimulants, hallucinogens, opiates, inhalants, depressants, and club drugs in the past 6 months on a Likert-type scale ranging from 1 (*never*) to 5 (*daily or almost daily*). Partner drug use demonstrated sufficient variability at each assessment occasion (scores ranged from 1 to 5 at each assessment; see Table 1 for means and *SD*).

Intervention assignment. Intervention assignment was coded as 0 (*TAU*) or 1 (*MTFC*).

Control variables. Because there are a number of factors that could influence the hypothesized associations, all initial models controlled for variables that could act as potential confounders. These variables included participant age at T1 in years, ethnicity (coded as 1 [Caucasian] or 2 [Not Caucasian]), cohort (coded as 1 [cohort 1] or 2 [cohort 2]), baseline/pretreatment illicit drug use (measured in the same way as her illicit drug use at T1–T5), the age at first reported use of any illicit drug, and intervention dosage (days spent in the randomized intervention condition).

Data Analytic Plan

All analyses were conducted using Mplus 6.11 (Muthén & Muthén, 2007), which uses full information maximum likelihood (FIML) to estimate parameters when data are missing. FIML uses all available data and produces unbiased estimates when data are missing at random (MAR). Because participants who did not provide information on a romantic partner *did* provide information on their drug use over the young adult assessment periods, these participants were included in our analyses because they are relevant to two of our three aims. For participants who did not report having a partner during an assessment occasion, partner drug use variables were entered as missing and this missingness was handled using FIML similar to all other missing data. To increase confidence that our model results were not biased by the inclusion of participants who did not report on any partners, we reran our models using the subsample of participants who reported on a partner during at least one young adult assessment. All results were equivalent in this subsample (results available upon request). We thus elected to retain the entire sample who participated in the young adult assessments; missing partner data (similar to all other missing data) were dealt with by the use of FIML. The Little's test of missing data (Little, 1988) indicated that the data were missing completely at random (MCAR); Little's MCAR χ^2 (743) = 721.28, $p = .71$. Measures of participant drug use and partner drug use did not evidence extreme levels of skewness or kurtosis. Models were deemed to have good fit if the chi-squared test was nonsignificant, if the comparative fit index (CFI) was >.95, and if the root mean square error of approximation (RMSEA) was <.06 (Hu & Bentler, 1999).

We first fit unconditional latent growth curve models for participants' drug use (Aim 1). To test for intervention effects (Aim 2), we then conducted multigroup analyses of the unconditional latent growth curves split by intervention assignment. To evaluate whether the intercepts (initial values) and/or slopes (change over time) were significantly different for the two groups (MTFC vs. TAU), we constrained these parameters to be equal across the two groups and evaluated the change in model fit between the model where the parameters were

TABLE 1
Correlations, Means, and Standard Deviations of Study Variables

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
1. T1 drug use	–																
2. T2 drug use	.48***	–															
3. T3 drug use	.41***	.68***	–														
4. T4 drug use	.53***	.53***	.58***	–													
5. T5 drug use	.39***	.41***	.29**	.50***	–												
6. T1 partner use	.44***	.31***	.40***	.43***	.32**	–											
7. T2 partner use	.29***	.65***	.47***	.53***	.54***	.40***	–										
8. T3 partner use	.15	.16	.38***	.32*	.16	.24*	.30**	–									
9. T4 partner use	.29*	.15	.29**	.58***	.54***	.12	.21	.41***	–								
10. T5 partner use	.35**	.17	.24*	.38***	.62***	.15	.24*	.31**	.70***	–							
11. Intervention	.06	.07	−.04	−.17	−.23*	.16	−.01	−.30**	−.14	−.12	–						
12. Age of onset	−.12	−.17	−.18	−.13	−.10	.06	−.16	−.06	−.07	−.05	.09	–					
13. Ethnicity	.13	−.10	−.01	−.04	.05	−.10	−.03	.01	.08	.06	−.06	.08	–				
14. Cohort	−.07	.01	.03	.17	.09	−.03	.02	.17	.13	−.02	.06	−.09	−.09	–			
15. Dosage	−.05	−.03	.07	−.18	.04	.02	.05	−.09	−.09	−.06	.14	−.03	.07	.01	–		
16. Baseline use	.06	.26**	.04	−.01	.01	.06	.16	.05	.02	.13	−.10	−.11	−.03	−.09	.16*	–	
17. T1 age	.01	−.05	−.09	−.22*	−.10	−.01	−.02	−.09	−.01	.10	.06	.07	.17*	−.82***	−.01	.09	–
Mean/%	1.50	1.62	1.35	1.44	1.50	1.29	1.21	1.24	1.20	1.25	48.8	12.23	68.7	48.8	174.6	2.49	22.33
SD	1.08	1.16	.91	.98	1.05	.86	.78	.81	.80	.87	NA	2.23	NA	NA	146.6	1.41	3.08

Note. Baseline use = drug use reported by participants at the baseline assessment prior to treatment assignment; % for treatment assignment indicates % assigned to MTFC (vs. TAU); % for ethnicity refers to % Caucasian (vs. Non-Caucasian); % for cohort refers to % of participants in cohort 1 (vs. cohort 2).
*$p < .05$; **$p < .01$; ***$p < .001$.

freely estimated versus that in which they were constrained to be equal. Finally, to test for associations with romantic partner drug use and interactions between treatment assignment and romantic partner drug use, we then added our time varying predictors (i.e., partner drug use at T1–T5 – Aim 3) to the latent growth model. To test for interactions between intervention assignment and romantic partner drug use, we again conducted multigroup analyses split by intervention assignment. To evaluate whether partner drug use was differentially associated with participant drug use at each young adult assessment, we constrained these parameters to be equal across the two groups and evaluated the change in model fit between the models where the parameters were freely estimated versus that in which they were constrained to be equal.

We initially analyzed the models including all of the control variables and noted any significant associations with control variables. To evaluate whether model fit was significantly worse when associations with nonsignificant covariates were assumed to be zero, we then fixed control paths to zero for those control variables that were not significantly associated with participant drug use or partner drug use, and decrement in model fit was examined. If fixing control paths to zero did not significantly worsen the fit of the model to the data, the more parsimonious model (i.e., the model in which nonsignificant control variables were removed) was retained (Mulaik et al., 1989; Wolfinger, 1996). All model parameters reported were obtained from this final model. As an additional test of the extent to which control variables may have influenced our results, we examined mean differences on participant and partner drug use by ethnicity and cohort, and correlations among participant and partner drug use with age, intervention dosage, age of drug use onset, and baseline drug use.

RESULTS

The following analyses were conducted to address the three goals of the current study: (1) examine the course of drug use during young adulthood in a sample of women with prior juvenile justice system involvement; (2) test the effects of MTFC delivered during adolescence on drug use trajectories in young adulthood; and (3) examine associations and interactions between participants' drug use and romantic partners' drug use over time.

Bivariate Correlations

There was evidence of moderate rank-order stability of young women's drug use over time, based on correlations among drug use variables from T1 to T5. Young women's drug use was positively associated with partners' drug use both cross-sectionally and longitudinally (see Table 1 for bivariate correlations among all study variables along with means and *SD*). Intervention assignment was significantly and negatively associated with T5 participant drug use and T3 partner drug use. Baseline participant drug use was significantly associated with T2 participant drug use and treatment dosage. Participant age was significantly negatively associated with participant drug use at T4. There were no other significant associations between participants' or partners' drug use and any other control variables or any mean differences by ethnicity or cohort (all ps > .05).

Developmental Trajectories of Drug Use

We first fit an unconditional latent growth curve model for participant drug use including all control variables. The model provided an adequate fit to the data, χ^2 (24) = 33.72, p = .09; RMSEA = .06; CFI = .93; Tucker-Lewis index (TLI) = .88. There was no significant association among any of the control variables and drug use intercept or slope. When the control paths were set to zero, the model provided a good fit to the data, χ^2 (35) = 38.51, p = .31; RMSEA = .03; CFI = .97; TLI = .97, and was statistically equivalent to the model that freely estimated the control paths; $\Delta\chi^2$ (11) = 4.79; p = .94. Thus, the more parsimonious unconditional growth model without control variables was retained (Mulaik et al., 1989; Wolfinger, 1996). In addition, the results presented below hold when all control variables are included (results available upon request). The mean intercept, or initial value, of drug use was μ_i = 1.52, p < .001, indicating average use between "never" and "once or twice" in the past 6 months; there was significant variability around this mean (σ_i^2 = .50, p < .01). The mean slope was not significant, μ_s = −.05, p < .10.

Intervention Effects on Developmental Trajectories of Drug Use

Next, we conducted a multigroup analysis to evaluate intervention effects on trajectories of drug use over time. When we constrained growth parameters to be equal across the two groups, model fit

was significantly worse than the model that allowed the parameters to be freely estimated for the two groups; $\Delta\chi^2$ (4) = 17.09, $p < .01$. This indicated that the growth parameters (i.e., means and variances of the intercept and slope) were significantly different between the two conditions. For those assigned to TAU, the drug use mean intercept was $\mu_i = 1.45$, $p < .001$ ($\sigma_i^2 = .12$, $p = .23$) and the mean slope was $\mu_s = .03$, $p = .18$ ($\sigma_s^2 = .05$, $p < .05$). For those assigned to MTFC, the mean intercept was $\mu_i = 1.54$, $p < .001$ ($\sigma_i^2 = .75$, $p < .001$) and the mean slope was $\mu_s = -.08$, $p < .05$ ($\sigma_s^2 = .03$, $p < .10$). Thus, those assigned to MTFC reported decreased drug use from T1 to T5, whereas those assigned to TAU did not report such decreases. See Figure 2 for a graph of the estimated means from T1 to T5 by intervention group assignment. To estimate the magnitude of this intervention effect, we calculated the effect size for group mean differences (MTFC vs. TAU) at the last young adult assessment (T5) and for group differences (MTFC vs. TAU) in the mean slope from T1 to T5 (Feingold, 2009; Raudenbush & Liu, 2001). The effect size at T5 was Cohen's $d = .45$, and the effect size for the mean linear slope from T1 to T5 was $d = .39$. These effect sizes indicate that the intervention effect was between small and medium.

Effects of Romantic Partners' Drug Use

Next, we tested our model including time varying (i.e., partner drug use) predictors. Because we anticipated that participant drug use at adjacent assessments and partner drug use at adjacent assessments would be associated, and because it was possible or likely that not all of this covariance would be accounted for by the covariance structure of the latent growth factors (Grimm & Widaman, 2010), drug use variables at adjacent time points were allowed to covary. When all paths from control variables to the growth parameters (intercept and slope) were freely estimated, the model provided a poor fit to the data; χ^2 (68) = 114.94, $p < .001$; RMSEA = .08; CFI = .81; TLI = .84. The only significant association with control variables was between age of drug use onset and the drug use intercept ($\beta = -.30$; $p < .05$). When we fixed all nonsignificant control paths to zero, model fit was statistically equivalent; $\Delta\chi^2$ (9) = 6.52; $p = .69$; indicating that all control variables other than drug use age of onset could be removed from the model for parsimony. After removing the nonsignificant control variables, the model provided an adequate fit to the data; χ^2 (36) = 52.65, $p = .04$; RMSEA = .06; CFI = .94; TLI = .93 (see Figure 3). Again, all results reported, with the exception of model fit, hold when all control variables are included (results available upon request). Partners' drug use was significantly associated with participants' concurrent drug use at each assessment point (T1 $\beta = .38$; T2 $\beta = .47$; T3 $\beta = .36$; T4 $\beta = .43$; T5 $\beta = .48$; all ps $< .001$). Last, the age at which participants' reported first using any illicit drug was significantly associated with the intercept, or initial value, of participants' drug use ($\beta = -.25$, $p < .05$), indicating that participants who started using drugs at younger ages reported significantly more drug use at the first young adult follow-up assessment. The estimated residual covariances between the drug use variables at adjacent time points were as follows: participant drug use: T1 & T2: $\beta = .11$, $p = .54$; T2 & T3: $\beta = .50$, $p < .001$; T3 & T4: $\beta = .31$, $p < .01$; T4 & T5: $\beta = .32$, $p = .08$; partner drug use: T1& T2: $\beta = .36$, $p < .001$; T2 & T3: $\beta = .26$, $p = .06$; T3 & T4: $\beta = .33$, $p < .01$; T4 & T5: $\beta = .74$, $p < .001$.

Last, we conducted analyses to examine whether assignment to MTFC made women less likely to be influenced by partner drug use. Similar to our unconditional latent growth curve analyses, we tested a multigroup model for our conditional latent growth curve model with time varying (i.e., partner drug use) predictors. We first allowed all parameters to be freely estimated for the two groups (MTFC vs. TAU). We then constrained the paths from partner drug use to participant drug use at T1–T5 to be equal for the two groups and tested whether model fit was significantly worsened. These analyses indicated that the constrained

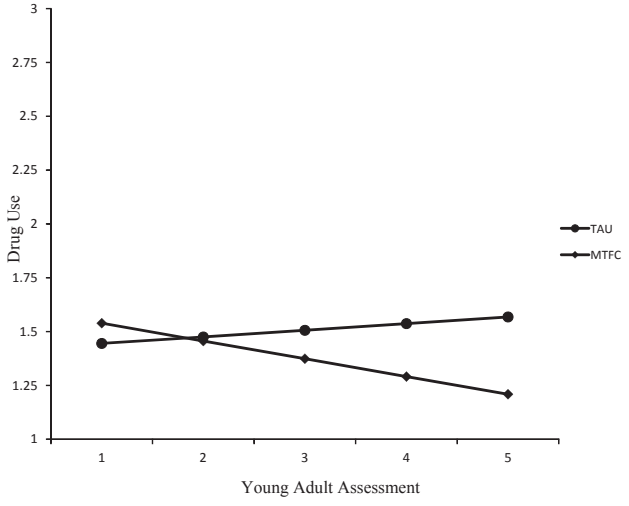

FIGURE 2 Estimated illicit drug use means by intervention assignment from T1 to T5.

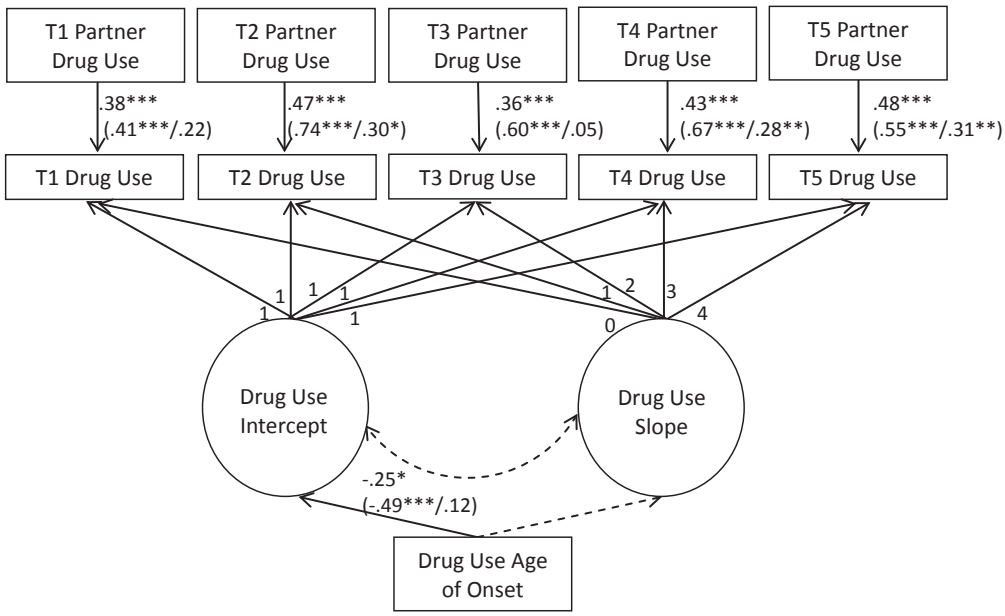

FIGURE 3 Latent growth curve with time varying covariates model estimates.
Note. χ^2 (36) = 52.65, p = .04; RMSEA = .06; CFI = .94; TLI = .93, All path coefficients are standardized. Coefficients in parentheses are for TAU and MTFC, respectively. Residual covariances for adjacent drug use variables (e.g., partner drug use T1 and partner drug use T2) are not illustrated for figure clarity.
*p < .05; **p < .01; ***p < .001.

model fit the data significantly worse than the unconstrained model $\Delta\ \chi^2$ (5) = 12.34, p < .05. After accounting for intra-individual change over time, participants who were randomly assigned to TAU reported stronger and more consistent associations between their drug use and their partners' drug use (βT1 = .41, p < .001; βT2 = .74, p < .001; βT3 = .60, p < .001; βT4 = .67, p < .001; βT5 = .55, p < .001), whereas those who were randomly assigned to MTFC reported weaker and less consistent associations (βT1 = .22, p > .05; βT2 = .30, p < .05; βT3 = .05, p > .05; βT4 = .28, p < .01; βT5 = .31; p < .01; see Figure 3).

DISCUSSION

The current study is the first of which we are aware to examine adolescent intervention effects on trajectories of drug use into young adulthood for women with histories of juvenile justice system involvement. This population is at high risk of drug use and associated problems (Chassin, 2008), and the current study demonstrated that MTFC has long-lasting effects on illicit drug use trajectories. Those randomly assigned to MTFC when they were 13–17 years old reported significant decreases in drug use over a 2-year period in young adulthood (7–9 years after the study began), while those randomly assigned to TAU did not report significant decreases in drug use during this time. Although prevalence rates of drug use in community samples tend to decrease after the early twenties (SAMHSA, 2012), the high-risk women in our sample who were assigned to TAU evidenced persistent drug use during young adulthood, indicating that, in the absence of a intensive, family-based, intervention (such as MTFC), adolescents with juvenile justice system involvement may be less likely to experience normative declines in drug use during young adulthood. Although it is not possible to make statistical comparisons of these different trajectories to those in a same-aged community sample because of the lack of a comparison group in the current study, it is likely that the trajectories of drug use for the MTFC group are more similar to those in community samples than are the trajectories for the TAU group.

Our significant intervention effects may be interpreted, in part, by theory and by empirical data suggesting that the depth of social capital, specifically the quality of close relationships, during young adulthood is associated with behavioral adjustment, including drug use (Pettit, Erath, Lansford, Dodge, & Bates, 2011). Additionally, family connectedness, trust, and support have been found to be negatively associated with adolescent substance use (Curran, 2007). The influence of MTFC (delivered in adolescence) on drug use

trajectories in young adulthood may thus function through its effects on improving parent–adolescent relationships, and the formation of increasingly supportive and nurturing friendships and romantic partnerships. The foster parents in MTFC are provided with very high levels of support and resources, and a main focus of the intervention is improving parent–adolescent relationships. In addition, individual placements versus placements in aggregate care settings likely result in more one-on-one attention and closer relationships between a caregiver and adolescent. It is thus likely that the foster parents in MTFC are more highly attuned to the needs of the adolescents in their care and more likely to have closer caregiver–adolescent relationships than are caregivers in group care facilities. Nonetheless, because placements lasted only 6 months (on average) and the effects on drug use trajectories were observed on average 7–9 years later, other mediating mechanisms are likely operating in this interim period that more directly impact drug use trajectories in young adulthood. For example, the biological families (or other aftercare resource families) received social-learning-based family therapy during the girl's placement in MTFC. This family therapy model has been found to be efficacious in numerous randomized trials (Forgatch & DeGarmo, 2011; Forgatch & Patterson, 2010). Also, the skills targeted and developed in adolescents via MTFC (e.g., motivation to avoid drugs, refusal skills, positive peer relations) may serve as a mechanism by which young women form and maintain high-quality social relationships in young adulthood. Future research would be needed to evaluate these, and other, potential mechanisms.

After accounting for individual trajectories of drug use over time, concurrent partner drug use was significantly associated with participants' drug use at each young adult assessment. This is consistent with prior findings that partner drug use is associated with increased risk of one's own use (Homish, Leonard, & Cornelius, 2007). The current study was not designed to examine the directionality or mechanisms of these effects. Thus, it is not completely clear whether the young women in our study selected partners who had similar drug use patterns, whether their partners' drug use influenced their own use via drug availability, approval of (or lack of disapproval of) drug use, and/or other mechanisms, or whether participants' drug use influenced their partners' drug use. These questions are worthy of future study and could help clarify the mechanisms by which one partner's drug use influences the drug use of the other partner, but were beyond the scope of the current study. Our results, however, do indicate that partner drug use is associated with young women's drug use even after accounting for individual trajectories of use. This suggests that partner drug use might function as an ensnaring mechanism (Hussong et al., 2004), impeding the normative declines in drug use during this period. Although the Hussong et al. study demonstrated that one's own drug use serves as an ensnaring mechanism for antisocial behavior in young adulthood, the current study is the first to indicate that *romantic partner* drug use may function similarly in influencing young women's drug use over time.

Our results also suggest that the influence of partner drug use on participant drug use during young adulthood was moderated by treatment assignment during adolescence. These results indicate that MTFC might reduce, although not eliminate, the influence of partner drug use on young women's drug use over time, as associations between partner drug use and participant drug use were weaker and less consistent for participants in the MTFC condition than for those in the TAU condition. Although we should interpret these findings with caution until replicated, given our relatively small sample, our results suggest that MTFC may increase young women's resiliency to partner drug use. The sizable lag between intervention and our assessment of drug use, combined with the remaining, although reduced, influence of partner drug use on participant drug use suggests that it might be beneficial to develop, and evaluate the potential benefits of, booster sessions focused on healthy relationship development and prosocial partner selection during young adulthood.

Although we initially controlled for a variety of potential confounds, the only control variable that evidenced associations with young adult drug use trajectories or partner drug use was the age of drug use onset. Earlier age at first drug use was associated with higher frequency of drug use at the first young adult follow-up assessment. Age at first use did not, however, significantly predict the slope of drug use through young adulthood. The mean age of drug use onset in this sample was 12.23 years and reported ages at first use ranged from 7 to 18 years. This is markedly lower than the average age of drug use initiation in a national sample, 18.1 years (SAMHSA, 2012). This difference is not particularly surprising considering the high-risk nature of our sample. However, it does indicate that adolescent (and younger) girls in the juvenile

justice system should be screened for drug use, even at quite young ages, and referred for services as indicated. It should be noted that, although participants in the current study were not recruited on the basis of drug use, they demonstrated substantial rates of drug use at the adolescent baseline assessment (on average reporting occasional use and with 64% of the sample reporting some amount of drug use). This reduced variability may partially account for why we did not observe consistent associations between baseline drug use and drug use at the young adult follow-up assessments (such an association was observed only at T2).

The primary limitation of the current study is its reliance on young women's report of their own drug use *and* their partners' drug use. Associations among these variables may at least partially reflect reporter bias. Ideally, these results will be replicated using combinations of self-reported and biologically verified drug use. It is also possible that the type and quality of these young women's romantic relationships could have influenced our results. The current sample provided information on a variety of different types of romantic partners (e.g., dating partners, cohabiting partners, spouses), and partnerships were of varying lengths and quality. Although not a focus of the current study, inclusion of partner relationship quality and relationship length could be a fruitful avenue for future research. It is possible that longer partnerships or those that are rated as closer may be more influential. Last, in relation to romantic partners, although the use of FIML allowed us to examine intervention effects and drug use trajectories in the full sample of women who participated in at least one young adult assessment, associations between romantic partner drug use and participant drug use can only be inferred for those who reported having an romantic partner during at least one assessment. More generally, although we used sophisticated modeling techniques to account for missing data (FIML) and had low attrition rates, attrition in the current study may have nonetheless influenced our study results. Last, because MTFC is a multicomponent intervention, it is not possible to determine which of the many intervention components drove the significant intervention effect on drug use over time.

In conclusion, findings from the present study indicate that random assignment to MTFC during adolescence resulted in decreasing drug use over a 2-year period in young adulthood and potentially increased resilience to partner drug use during this period. In addition to the intervention effect and individual trajectories of use over time, romantic partner drug use was concurrently associated with participants' drug use at each young adult assessment. Although it is not completely clear which member of the dyad is driving this association, this may indicate that efforts to prevent or decrease drug use from adolescence to young adulthood should include a focus on close relationships, including romantic partnerships. The intervention literature suggests that "booster sessions," brief interventions administered after a more intensive intervention that are designed to maximize the long-term impact of the initial intervention, can lead to lasting outcomes (Bundy, McWhirter, & McWhirter, 2011; Tolan, Gorman-Smith, Henry, & Schoeny, 2009). Findings from the present study suggest that intervention booster sessions focused on romantic relationships during late adolescence and young adulthood might be one potential strategy to augment the main intervention to further reduce drug use. Given the current findings and other positive intervention effects of MTFC for seriously delinquent youths (Chamberlain et al., 2007; Harold et al., 2013; Kerr et al., 2009; Leve & Chamberlain, 2007; Leve et al., 2005), it is clear that MTFC presents an improvement over treatment as usual. Providing higher levels of support and training to foster parents may improve long-term outcomes for children in out-of-home care. More wide-spread uptake of MTFC is currently occurring, with implementation of the program in over 100 sites in the United States and internationally. More broadly, it is clear, from the current study and others, that interventions designed to improve family relationships have a significant influence on child, adolescent, and adult adjustment (Chamberlain et al., 2007; Henggeler & Sheidow, 2012; Kazdin, 1998). Thus, wider implementation of prevention and intervention programs designed to support families and improve caregiver–child relationships would likely result in more positive adjustment for families, children, and adolescents. From a financial perspective, we are beginning to evaluate the long-term cost savings of MTFC versus treatment as usual in order to assist policymakers in making resource allocation decisions.

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