




## AN EVALUATION OF MECHANISMS OF CHANGE IN MULTISYSTEMIC THERAPY FOR JUVENILE JUSTICE- INVOLVED YOUTHS A DECADE FOLLOWING TREATMENT

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*Although researchers have identified the more immediate mechanisms of change in family-based treatments for juvenile justice-involved youths, it is not known whether these same mechanisms continue to prevent criminal offending into adulthood. The present study evaluated whether caregiver-directed improvements in family relations, youth prosocial peer relations, and youth academic performance during multisystemic therapy (MST) for serious and violent juvenile offenders had an impact on young adult involvement in criminal activity and sentencing 10.2 years following treatment. The results showed that improvements in family relations were associated with reduced odds of criminal outcomes a decade later for former MST participants. Furthermore, improvements in youth prosocial peer relations and academic performance were also related to lower odds of long-term criminal activity. These results are consistent with the underlying theory of change in family-based treatments and demonstrate that caregivers are critical to achieving and sustaining decreased antisocial behavior for youths with serious and violent criminal histories.*

A growing body of research suggests that family-based treatments are most effective in ameliorating violent and other serious antisocial behaviors, including criminality, in youths (Dopp, Borduin, White, & Kuppins, 2017; Henggeler & Sheidow, 2012; McCart & Sheidow, 2016). A fundamental assumption (i.e., theory of change) of these treatments is that improvements in family relations (e.g., caregiver–youth relations, relations between caregivers, the overall family environment) can reduce serious antisocial behavior in youths across the lifespan (Bateson, 1972; Minuchin, 1985). Moreover, theorists have noted that changes in family relations can lead to improvements in extrafamilial factors (e.g., peer relations, academic performance) that are also vital to the amelioration of youth antisocial behavior (Henggeler & Borduin, 1990; Minuchin, 1985). Although this underlying theory of change for family-based treatments seems reasonable and is consistent with how various family interventions are designed by their developers, the empirical support for this theory in the long-term reduction of youth antisocial behavior remains quite limited.

Multisystemic Therapy (MST; Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009), a family- and community-based treatment for youths with serious antisocial behaviors, has demonstrated reductions in participants' criminality and violence lasting more than two decades after treatment (Sawyer & Borduin, 2011). The theory of change underlying MST posits, first, that youth antisocial behavior is driven by multiple influences encompassing individual, familial, and extrafamilial risk factors. Thus, to be effective, MST interventions should be comprehensive and

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individualized (i.e., specific to a particular youth and family) to address these risk factors and to simultaneously foster the development of prosocial behavior. A second underlying assumption of MST is that caregivers are the most proximal influence on reductions in youth problem behavior and on increases in youth prosocial behavior across key social-ecological systems. Therefore, interventions that empower caregivers to improve their supervision and discipline practices are viewed as particularly important in MST because such improvements are considered essential mechanisms of positive changes in the youth's family relations (e.g., caregiver–youth relations, relations among family members) and the youth's relations with extrafamilial systems (e.g., peers, school). Ultimately, these caregiver-directed changes in the youth's social ecology are thought to play key roles in reducing antisocial and other problem behaviors for the youth (see Figure 1).

Three studies with juvenile justice-involved youths have provided short-term evaluations of caregiver-directed mechanisms of change in MST. In each study, caregiver reports of positive changes in family relations (i.e., increases in monitoring and consistent discipline) were linked with reductions in antisocial behavior for youths at treatment completion (Deković et al., 2012; Henggeler, Letourneau et al., 2009; Huey, Henggeler, Brondino, & Pickrel, 2000). In addition, Huey et al. (2000) found that self-reports of caregiver-directed decreases in youth associations with deviant peers were also related to reductions in youth antisocial behavior at the close of treatment. Although this latter finding points to the central role that MST caregivers play in the reduction of youth involvement with deviant peers, it remains to be determined whether caregiver-directed changes in youth involvement with prosocial peers are also an important element of MST-related improvements in youth behavior. Furthermore, it is not known whether youth perceptions of caregiver-directed mechanisms of change are also related to reductions in their antisocial behavior. Moreover, researchers have yet to examine whether caregiver-directed familial and extrafamilial changes during treatment have positive effects on youth criminality into adulthood. Indeed, given that serious and violent juvenile offenders often continue their criminal careers well past adolescence (see Laub & Sampson, 2001), it seems imperative to more fully evaluate the mechanisms by which MST leads to longer-term reductions in crime.

The present study provided the first evaluation of whether the mechanisms of change in MST extend in their reach beyond adolescence. We evaluated the effects of caregiver-directed familial (i.e., supervision and consistent discipline) and extrafamilial (i.e., prosocial peer relations and academic performance) changes, as reported by both youths and their caregivers, on serious antisocial behavior (i.e., involvement in violent, nonviolent, or drug-related crimes) and sentencing (i.e., days sentenced to incarceration or probation) for MST participants a decade following treatment. To that end, the current study examined adult criminal court records for youths who had participated in MST as part of an effectiveness trial of sexual and other violent offending in which treatment was delivered by community-based clinicians.

## METHOD

### *Design*

The criminal court outcomes of 50 youths who participated in MST as part of a larger randomized clinical trial (Letourneau et al., 2009) were examined, on average, 10.2 years postbaseline. A pretest–posttest control group design was used in the original trial, with random assignment to

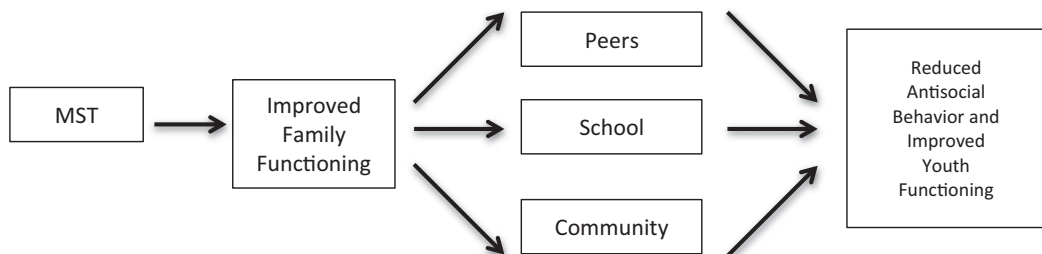


Figure 1. The multisystemic therapy (MST) theory of change.

conditions (i.e., MST or treatment as usual [TAU]) and a 6-month follow-up of baseline measures, which corresponded with the end of treatment.

### *Participants*

Youths and their families were referred to participate in a randomized effectiveness trial of MST from January 2004 through June 2006 (Letourneau et al., 2009). Inclusion criteria for participation required that the referred youths (a) had been charged or adjudicated with at least one index sexual offense (e.g., aggravated criminal sexual assault, criminal sexual assault), (b) reside with at least one caregiver and not be in temporary care, (c) be from 11 to 17 years of age at the time of recruitment, (d) not have psychotic symptoms or a developmental delay, and (e) be fluent in either English or Spanish. For the purposes of the present study, we focused only on the youths who were randomized to participate in MST.

At 3-years postbaseline, all of the youths ( $N = 68$ ) who had originally been randomized to MST were asked to consent to a long-term follow-up of their public records (i.e., criminal and civil suit records); 50 of the original 68 youths (74%) consented to a long-term follow-up of their criminal court records. The youths who consented to the present follow-up were all males (only 2.4% of participants in the original trial were female); these youths were on average 14.7 years old ( $SD = 1.7$ ) at the time of recruitment into the original study and 25.6 years old ( $SD = 1.8$ ) at the time of follow-up; 45% were African American, 16% were Caucasian, and 39% were multiracial; 37% also identified as having Hispanic/Latino ethnicity. The vast majority (84%) of the youth's caretakers were female. Similar to the youths, 52% of their caregivers were African American, 17% were Caucasian, and 31% were multiracial; 30% of the caregivers also identified as Hispanic/Latino.

The arrest histories of the referred youths attest to their serious criminal involvement. Indeed, in addition to having committed at least one sexual offense, 35% of the youths had one or more violent nonsexual offenses (e.g., assault and battery with intent to kill, aggravated assault) prior to treatment. There were no significant demographic differences or differences in pretreatment arrest history between individuals who did or did not consent to the follow-up, as demonstrated by  $t$  tests and chi-square tests.

### *Treatment*

**MST.** MST (Henggeler, Schoenwald et al., 2009) is guided by family systems theory (Bateson, 1972; Hoffman, 1981; Minuchin, 1985) and the theory of social ecology (Bronfenbrenner, 1986), both of which are consistent with research findings on the correlates and causes of criminality in youths and serve as a basis for case conceptualization and treatment planning in MST, including MST for youths with sexual offenses (see Borduin, Dopp, Borduin, & Munsch, 2016). MST interventions are individualized and seek to address a comprehensive set of individual, family, peer, school, and neighborhood risk and protective factors. At the family level, MST interventions typically aim to (a) remove barriers to effective parenting, (b) enhance parenting knowledge, and (c) promote affection and communication among family members. At the peer level, interventions are conducted by the youth's caregivers, with the guidance of the therapist, and often consist of active support and encouragement of relationship skills and associations with nonproblem peers, as well as substantive discouragement of associations with deviant peers (e.g., applying significant sanctions). Likewise, under the guidance of the therapist, the caregivers often develop strategies to monitor and promote the youth's academic performance; interventions in this domain typically focus on establishing improved communication between caregivers and teachers and on restructuring after-school hours to promote academic efforts. Finally, in some cases, individual interventions are used with a caregiver or youth to modify the individual's social perspective-taking skills, belief system, or attitudes that contributed to criminal behavior. Viewed together, MST interventions aim to ameliorate both short-term and long-term antisocial behavior by making lasting changes in familial and extrafamilial functioning.

Four MST therapists were employed by a community-based provider agency and consisted of master's- and bachelor's-level clinicians. Two of the clinicians were female and two were male; two were Caucasian and two were African-American. Two of the therapists had prior MST experience and all completed the 5-day standard MST training and 2-day MST training for problem sexual

behaviors prior to the trial. Each therapist worked on a team and was responsible for an individual caseload of 4–6 youths. During the entire trial, the therapists were available to the youths and their families 24 hr a day, 7 days a week. Therapists typically made 2–3 visits per week at a location convenient to the youth and family (e.g., home, school) near the beginning of treatment and once per week closer to treatment termination. The average length of treatment was 7.1 months ( $SD = 2.8$ ). One of the therapists was bilingual and able to provide services to families in both Spanish and English. Adherence to MST treatment principles was assessed with the MST Therapist Adherence Measure (Henggeler & Borduin, 1992). The mean adherence score was 3.99 ( $SD = 0.68$ ) on a 5-point scale, which was lower than the typical mean adherence score when standard MST is provided in community settings (Schoenwald et al., 2003); however, there was a 91% treatment completion rate, which both met and exceeded MST program standards.

### *Research Procedures*

The present follow-up study was approved by the institutional review boards at the University of Missouri and Johns Hopkins University. All participants in the current study had consented to participate in a long-term follow-up of their juvenile and adult court records.

*Original trial.* Families referred to the original project were initially contacted via phone and later in person by a research assistant who obtained informed consent and assent. Families were informed that participation in the research was voluntary and that refusing to participate or discontinuing participation would not jeopardize the receipt of treatment services or result in sanctions from the court. Research assistants administered an assessment battery to each youth and his caregiver at baseline and again at 6-months postbaseline, the latter of which corresponded with the end of treatment. Various measures from these assessment batteries were used to derive indexes of change in the present study and are described later.

*Present study.* The present study accessed local and state (Illinois) public court records. Records of interest included those pertaining to arrests (i.e., violent sexual, violent nonsexual, non-violent, or drug-related) and sentencing information (i.e., days sentenced to incarceration or probation) that took place from the date of each youth's completion of treatment until 10 years postbaseline. Several steps were taken to reduce the possibility of false positives for participants whose names were present in court records (i.e., using names, date of birth, known addresses, and state identification numbers). We were able to match all of the participants' records using these steps.

### *Change Measures*

From the baseline and 6-month postbaseline assessments, we chose measures of family, peer, and academic functioning to represent central aspects of the MST theory of change. We examined hypothesized indicators of caregiver-directed changes in familial (i.e., caregiver supervision and discipline) and extrafamilial (i.e., prosocial peer relations, academic performance) functioning. Change scores were calculated separately for youth and caregiver reports on each measure and were used as indexes of improvement (i.e., a positive score) or deterioration (i.e., a negative score) that had occurred during treatment (i.e., from baseline to postbaseline).

*Caregiver–youth relations.* Youth and caregiver reports on the Pittsburgh Youth Study Parenting Scales (PYS; Loeber, Stouthamer-Loeber, van Kammen, & Farrington, 1991) were used to assess caregiver supervision of the youth (e.g., caregiver knowledge of the youth's whereabouts) and caregiver engagement in consistent discipline practices (e.g., caregiver follow-through on discipline). The internal consistencies (Cronbach's alphas) on the scales ranged from .67 to .85 across reporters (i.e., youths and caregivers) and times of assessment (i.e., baseline and postbaseline).

*Academic performance.* The Academic Performance subscales from the Youth Self Report (YSR; Achenbach, 1995) and Child Behavior Checklist (CBCL; Achenbach, 2001) were used to measure youth and caregiver reports, respectively, of youth scholastic functioning. These well-validated subscales are considered excellent indices of youth performance in school (Achenbach, Rescorla & Maruish, 2004) and assess grades in core subjects as well as the receipt of special education services. Cronbach's alphas on the subscales ranged from .60 to .76 across reporters and times of assessment.

*Prosocial peer relations.* Youth and caregiver reports of prosocial peer relations were measured using the Social Competence subscales of the YSR and CBCL, respectively. These subscales include items pertaining to youth involvement in prosocial activities (e.g., being involved in a club at school) and engagement with prosocial peers. The internal consistencies (alphas) across reporters and times of assessment ranged from .66 to .83.

#### *Outcome Measures*

*Criminal records.* In the present study, court records pertaining to arrests (i.e., convictions) were coded by type of crime. Consistent with the fact that sexual recidivism is a low base rate event for youths with a history of illegal sexual behaviors (Caldwell, 2010, 2016), only two instances of officially recorded sexual recidivism (i.e., both violent sexual assaults) were identified in the present sample throughout the 10.2-year follow-up period. Thus, we collapsed across sexual and nonsexual crimes and coded them into three broad categories: violent (e.g., assault, murder), nonviolent (e.g., theft, forgery), and drug-related (e.g., possession of an illegal substance). Also of interest was the number of days of incarceration or probation to which the participant had been sentenced. If a participant had been sentenced to incarceration but had the sentence suspended in favor of probation, then only days sentenced to probation were recorded. Cases that had yet to be deposed or tried in court were not included in the study. Traffic court records, which include minor traffic violations, also were not included in the dataset. On average, of those individuals who participated in the present follow-up, 28% had been rearrested for violent crimes ( $M = 0.42$ ;  $SD = 0.84$ ), 36% for nonviolent crimes ( $M = 0.58$ ;  $SD = 1.03$ ), and 32% for drug-related crimes ( $M = 0.58$ ;  $SD = 0.70$ ) during follow-up. In addition, participants had been sentenced to an average of 787.38 days of incarceration ( $SD = 1697.91$ ) and 544.90 days of probation ( $SD = 790.13$ ).

## RESULTS

#### *Preliminary Analyses*

Means and standard deviations were calculated for change scores related to youth and caregiver reports of caregiver supervision, caregiver consistent discipline, youth prosocial peer relations, and youth academic performance (see Table 1). Bivariate correlations were also computed and indicated that change scores across domains were not significantly correlated. Furthermore, change scores did not differ by a family's consent status (i.e., agreement or lack of agreement to participate in the study) or race, as evaluated by *t* tests.

All 50 youths and families in the present study completed pre- and posttreatment assessments. Of note, less than 5% of participants had data missing at the item level. Furthermore, these data were considered to be missing at random and appropriate for multiple imputation. Multiple imputation to replace missing items was conducted with the R (R Core Team, 2015) package *mice* (van Buuren & Groothuis-Oudshoorn, 2011).

#### *Primary Analytic Strategy*

Logistic regressions (McCullagh & Nelder, 2018) were performed to determine whether the effects of MST on various criminal outcomes (i.e., violent, nonviolent, or drug-related crimes; being sentenced to incarceration or probation) were associated with pre- to posttreatment changes on youth and caregiver reports of caregiver–youth relations (i.e., supervision, consistent discipline), youth prosocial peer relations, and youth academic performance. Logistic regressions are appropriate for data with binary outcomes (i.e., arrested vs. not arrested, sentenced vs. not sentenced; McCullagh & Nelder, 2018) as well as data that are censored (i.e., data with a large proportion of zeroes), given that many of the participants were neither arrested nor sentenced to incarceration or probation. All analyses were conducted in R (R Core Team, 2015).

Logistic regression yields estimates known as *odds ratios* (OR). An OR value greater than 1.0 indicates increased odds of an outcome, whereas a value lower than 1.0 indicates decreased odds. Thus, in the present study, a value below 1.0 demonstrates decreased odds of criminal involvement linked with treatment-related improvements in caregiver–youth relations, prosocial peer relations, or academic functioning. Values closer to zero indicate that treatment-related gains had a larger

Table 1

*Means and Standard Deviations for Change Scores Reflecting Caregiver- and Youth-Reported Improvements on Family, Peer, and Academic Functioning Variables During Treatment*

Variable	Youth report		Caregiver report	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Supervision	0.51	0.46	0.10	0.28
Consistent discipline	0.18	0.45	0.12	0.36
Prosocial peer relations	1.23	2.25	1.99	2.17
Academic performance	0.07	0.41	0.95	0.65

*Note.* *M* = mean; *SD* = standard deviation.

effect in reducing the odds of criminal involvement; the size of the effect in reducing the odds of criminal involvement can also be expressed as a percentage.

#### *Criminal Arrests*

As shown in Tables 2 and 3, logistic regressions revealed that improvements in caregiver–youth relations (i.e., increases in supervision and consistent discipline by caregivers) from pre- to posttreatment were generally related to lower odds of youth arrests for all types of crimes at the 10.2-year follow-up. More specifically, treatment-related increases in caregiver supervision were related to reduced odds of youth involvement in violent crimes (youth report only; 97% decrease in odds), nonviolent crimes (caregiver report only; 88% decrease in odds), and drug-related crimes (youth report only; 76% decrease in odds) at follow-up. In addition, increases in caregiver consistent discipline (youth report) were associated with reduced odds of youth arrests for both violent crimes (81% decrease in odds) and nonviolent crimes (90% decrease in odds) at follow-up, although the results for violent crimes were only marginally significant ( $p = .08$ ; for a justification of interpreting marginally significant results, see Rosnow & Rosenthal, 1989). Furthermore, increases in caregiver consistent discipline (caregiver report) were related to reduced odds of youth involvement in drug-related crimes (80% decrease in odds). Finally, caregiver-directed improvements in youth prosocial peer relations (youth report) were also related to reduced odds of youth involvement in nonviolent crimes (31% decrease in odds). Ancillary analyses revealed that demographic variables (i.e., race, age) did not moderate these results.

#### *Punitive Sentencing*

As shown in Tables 4 and 5, logistic regressions indicated that improvements in caregiver–youth relations from pre- to posttreatment were associated with lower odds of youths being sentenced to either incarceration or probation at the 10.2-year follow-up. More specifically, increases in caregiver supervision, as reported by youths, were related to reduced odds of youth sentencing to either incarceration (97% decrease in odds) or probation (93% decrease in odds); caregivers' reports of their increased supervision were also related to reduced odds of youth sentencing to incarceration (91% decrease in odds), although this effect was only marginally significant ( $p = .08$ ). In addition, caregivers' reports of their increases in consistent discipline had a marginally significant effect ( $p = .07$ ) on the reduced odds of youths being sentenced to incarceration at follow-up (83% decrease in odds). Moreover, youth-reported improvements in prosocial peer relations ( $p = .09$ ) and academic performance ( $p = .07$ ) also had marginally significant effects on the odds of being sentenced to incarceration at follow-up (25% and 86% decreases in odds, respectively). As before, ancillary analyses revealed that race and age did not emerge as moderators of these results.

Table 2

*Odds of Different Crimes During Follow-Up Related to Youth-Reported Improvements on Family, Peer, and Academic Functioning Variables During Treatment*

Variable	Violent crimes		Nonviolent crimes		Drug-related crimes	
	<i>OR</i>	95% CI	<i>OR</i>	95% CI	<i>OR</i>	95% CI
Supervision	0.03*	[0.00, 0.29]	0.33	[0.05, 1.56]	0.24*	[0.03, 0.51]
Consistent discipline	0.19 <sup>†</sup>	[0.03, 1.13]	0.10*	[0.01, 0.57]	1.02	[0.21, 5.03]
Prosocial peer relations	0.88	[0.62, 1.27]	0.69*	[0.46, 0.97]	0.84	[0.60, 1.15]
Academic performance	1.30	[0.06, 4.93]	0.22	[0.02, 1.67]	0.34	[0.04, 2.21]

*Note.* *OR* = odds ratio; CI = confidence interval. Odds ratio values below 1.0 indicate decreased odds of criminal involvement.

\**p* < .05.

<sup>†</sup>*p* < .08.

Table 3

*Odds of Different Crimes During Follow-Up Related to Caregiver-Reported Improvements on Family, Peer, and Academic Functioning Variables During Treatment*

Variable	Violent crimes		Nonviolent crimes		Drug-related crimes	
	<i>OR</i>	95% CI	<i>OR</i>	95% CI	<i>OR</i>	95% CI
Supervision	0.14	[0.00, 1.66]	0.12*	[0.01, 0.71]	0.09	[0.00, 1.30]
Consistent discipline	0.60	[0.09, 3.71]	0.29	[0.04, 1.66]	0.20*	[0.02, 0.68]
Prosocial peer relations	1.03	[0.76, 1.44]	1.14	[0.85, 1.57]	0.77	[0.55, 1.06]
Academic performance	1.71	[0.64, 5.01]	1.19	[0.57, 3.14]	1.14	[0.40, 3.23]

*Note.* *OR* = odds ratio; CI = confidence interval. Odds ratio values below 1.0 indicate decreased odds of criminal involvement.

\**p* < .05.

## DISCUSSION

The present study evaluated whether caregiver-directed improvements in family relations, youth prosocial peer relations, and youth academic performance during MST for serious and violent juvenile offenders had an impact on young adult involvement in criminal activity and sentencing 10.2 years following treatment. The results indicated that enhanced caregiver supervision during treatment was generally associated with reduced odds of arrests for all types of crimes (i.e., violent, nonviolent, and drug-related) and of sentencing to incarceration or probation for former participants at follow-up. In addition, increased caregiver consistency in discipline during treatment was related to decreased odds of arrests for nonviolent crimes and of incarceration for former participants. The results also suggested that, to a lesser extent, caregiver-directed changes in

Table 4

*Odds of Incarceration and Probation During Follow-Up Related to Youth-Reported Improvements on Family, Peer, and Academic Functioning Variables During Treatment*

Variable	Incarceration		Probation	
	<i>OR</i>	95% CI	<i>OR</i>	95% CI
Supervision	0.03*	[0.00, 0.29]	0.07*	[0.00, 0.55]
Consistent discipline	0.39	[0.07, 1.97]	0.31	[0.05, 1.48]
Prosocial peer relations	0.86	[0.60, 1.16]	0.75 <sup>†</sup>	[0.52, 1.02]
Academic performance	0.61	[0.07, 4.83]	0.14 <sup>†</sup>	[0.01, 1.05]

*Note.* *OR* = odds ratio; *CI* = confidence interval. Odds ratio values below 1.0 indicate decreased odds of being sentenced to incarceration or probation.

\* $p < .05$ .

<sup>†</sup> $p < .10$ .

Table 5

*Odds of Incarceration and Probation During Follow-Up Related to Caregiver-Reported Improvements on Family, Peer, and Academic Functioning Variables During Treatment*

Variable	Incarceration		Probation	
	<i>OR</i>	95% CI	<i>OR</i>	95% CI
Supervision	0.09 <sup>†</sup>	[0.00, 1.15]	0.19	[0.01, 1.82]
Consistent discipline	0.17 <sup>†</sup>	[0.02, 1.05]	0.28	[0.04, 1.51]
Prosocial peer relations	0.91	[0.67, 1.23]	1.19	[0.89, 1.61]
Academic performance	2.18	[0.83, 6.27]	1.21	[0.50, 3.00]

*Note.* *OR* = odds ratio; *CI* = confidence interval. Odds ratio values below 1.0 indicate decreased odds of being sentenced to incarceration or probation.

<sup>†</sup> $p < .09$ .

extrafamilial domains played an important role in reducing long-term criminal involvement for youths who had participated in MST. Indeed, increased youth association with prosocial peers during treatment was related to decreased odds of youth involvement in nonviolent crimes and of youth sentencing to probation at follow-up. Furthermore, improved youth academic performance was also related to reduced odds that youths would be sentenced to probation at follow-up.

Our study contributes to prior work on the MST theory of change in two important ways. First, the results support the assumption of MST developers that positive changes in family functioning during treatment should have lasting effects in reducing antisocial behavior for MST participants (Henggeler & Borduin, 1990). In fact, it appears that improved family dynamics are an important driver of both short- (Đeković et al., 2012; Henggeler, Letourneau et al., 2009) and long-term desistance from criminal offending for youths who participate in MST. Second, the findings suggest that improvements in both family and peer relations during treatment are maintained through early adulthood. This suggestion is consistent with other research demonstrating that positive social bonds in adulthood are related to desistance from crime among individuals with a history of juvenile justice involvement (Laub & Sampson, 2001). Viewed together, the present



findings add to a growing body of research on the effectiveness of family-based interventions in the amelioration of youth antisocial behavior (Dopp et al., 2017).

Of the various possible caregiver-directed changes that were examined in the present study, improvements in caregiver supervision and discipline were most often associated with reduced odds of long-term criminal activity. These findings are consistent with previous studies of mediators of short-term outcomes in MST (e.g., Deković et al., 2012; Huey et al., 2000) and highlight the key roles played by both supervision and discipline in reducing youth antisocial behavior. Indeed, supervision is a proactive parenting practice that is more often used to prevent misbehavior, whereas discipline is a reactive parenting practice that is typically used in response to a youth's misbehavior. Thus, it appears that both proactive and reactive parenting strategies may be needed to mitigate the risk of serious criminal activity. In future work, we hope to determine whether the removal of certain barriers to supervision and discipline (e.g., substance abuse, mental health problems) is more effective than the removal of other such barriers (e.g., marital difficulties, low social support) in reducing youth criminal involvement over time. For example, a dismantling study could help to establish which interventions (e.g., contingency management for substance use, parenting skills training) have the greatest effects on youth functioning across MST cases. However, given the individualized nature of MST interventions, it seems reasonable to suggest that the removal of certain barriers to supervision and discipline may be more effective in some cases than others (e.g., single parents may need help with building support networks while married parents may need interventions that ameliorate spousal conflicts). As such, some interventions may be indicated for all caregivers, whereas other interventions may be needed on a case-by-case basis.

It is noteworthy that caregiver-directed improvements in prosocial peer relations were associated with reduced odds of involvement in nonviolent crimes. Our findings suggest that the prevention of nonviolent crimes in MST may require a concentrated effort by caregivers to encourage the youth's association with prosocial peers. However, given that nonviolent crimes often occur in the company of deviant peers (Dodge, Dishion, & Lansford, 2006; Vitaro, Brendgen, & Lacourse, 2015), it seems likely that disengagement from such peers as well as increased association with prosocial peers are both necessary to mitigate long-term involvement in nonviolent crimes. Even so, the present study did not include a measure of youth affiliation with deviant peers; such a measure would be worth including in future research that examines mediators of change for MST or other family-based treatments for youths with serious and violent criminal histories.

Although many of the results in this study were consistent across youth- and caregiver-reported improvements in functioning, some discrepancies should be noted as well. For example, significant (or near-significant) links between improvements in extrafamilial (i.e., peer, school) functioning and reductions in long-term criminal activity emerged for youth reports but not for caregiver reports on pertinent measures. Perhaps youths are most able to identify subtle but meaningful changes in their peer relations and academic performance because these changes affect them most directly. Conversely, caregivers must often obtain knowledge about their youth's friendships and grades in school through the reports of other individuals (e.g., the youth, teachers, neighborhood residents). Moreover, other research suggests that caregivers of at-risk youths, such as the caregivers in the present sample, report less knowledge about their youths' activities than do caregivers of youths with lower levels of risk (De Los Reyes et al., 2010). Of course, some of the discrepancies between youth and caregiver reports in the present study may be due to our relatively modest sample size, which resulted in less-than-optimal statistical power to detect small effects.

The present results also have implications for family-based clinical practice with justice-involved youths. Although MST interventions are often administered conjointly rather than in isolation, several interventions targeting parenting practices (e.g., supervision and discipline) are frequently used in MST (Henggeler, Letourneau et al., 2009). These interventions include behavioral parent training strategies (e.g., rewards and consequences, developing household rules), motivational interviewing (to address low caregiver engagement), cognitive restructuring (to target distorted cognitions around parenting), and marital therapy (to address conflicts between caregivers about parenting and other issues). In addition, MST includes several common interventions to help caregivers facilitate youth prosocial peer affiliations, such as guiding caregivers to become knowledgeable about their youths' interests, promoting contact between caregivers and the parents of their youths' friends, and teaching caregivers to encourage their youths' involvement in school

and community activities. Finally, in the academic domain, MST interventions often build caregivers' skills for improving home/school communication, setting up at-home behavioral reward systems for good grades, and promoting the value of academics at home. In all cases, the selection and use of specific parenting interventions depend on the therapist's prioritization of factors that represent likely causes of the youth's offending.

The present study has several methodological limitations. First, we assessed criminal activity during the follow-up using official arrest records, which are generally an underestimate of the actual number of crimes committed by individuals (Elliott, 1995; Farrington, 2009). However, arrest records are one useful index of serious criminal involvement and likely represented an accurate estimate of the effects of family, peer, and academic improvements on reductions in long-term criminality in MST participants. Second, we were unable to obtain consent to follow approximately one quarter of the MST participants from the original clinical trial; many of these participants had moved after the trial and could not be located for consent. Nevertheless, we were successful in obtaining consent and follow-up data for a majority (74%) of the MST participants. Third, we were unable to include the control group from the original trial in the present study owing to a low rate of consent to follow-up as well as difficulty verifying that other youths (who had consented) remained in the state at the time of follow-up. Fourth, the internal consistencies for some of our measures were less than optimal. However, these internal consistencies are similar to those obtained in other studies of racial and ethnic minority clinical populations (see Hall, 2001, for a review), including studies using the YSR and CBCL (e.g., Lacalle, Ezpeleta, & Domenech, 2012). Fifth, because our small sample size did not allow us to model the interdependence of caregiver and youth reports, our findings should be interpreted with caution; we recommend that future studies of MST and other family-based treatments use larger samples to permit modeling of interdependence of data from different family members (see Cook & Kenny, 2005). Finally, the present study did not assess warmth and bonding between caregivers and youths; these important dimensions of caregiver–youth relations may also be linked with long-term reductions in criminal behavior for former MST participants.

In conclusion, the present findings support the two primary assumptions of the MST theory of change: (a) comprehensive improvements in a youth's social ecology are necessary to ameliorate antisocial behavior and (b) caregiver actions are essential to make these changes. Over a follow-up period of more than a decade, caregiver efforts that led to improvements in family and extrafamilial functioning were linked with reductions in a broad range of criminal outcomes. These findings suggest that the process of guiding caregivers to change their youth's social ecology in MST has enduring benefits as the youth continues to develop and mature into young adulthood.

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