

LONG-TERM PREVENTIVE EFFECTS OF MULTISYSTEMIC THERAPY ON
CRIMINALITY IN SIBLINGS OF JUVENILE OFFENDERS

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CRIMINALITY IN SIBLINGS OF JUVENILE OFFENDERS

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ABSTRACT

In this study, the author examined the long-term criminal outcomes of 110 nonreferred siblings of serious and violent juvenile offenders who had participated in either multisystemic therapy (MST) or individual therapy (IT) in a randomized clinical trial (Borduin et al., 1995). Arrest and incarceration data were obtained on average 25.0 years later when siblings were on average 38.4 years old. Intent-to-treat analyses showed that recidivism rates were significantly lower for siblings in the MST condition than for siblings in the IT condition (43.3% vs. 72.0%, respectively). In addition, siblings in the IT condition were about three times as likely to be convicted of a felony and more than twice as likely to be sentenced to incarceration and probation during adulthood. This investigation represents the longest and most comprehensive follow-up to date of sibling participants in a family-based treatment and demonstrates that MST has long-term benefits for brothers and sisters of serious and violent juvenile offenders.

CHAPTER I

INTRODUCTION

Serious juvenile offending is a major social and clinical problem. As a social problem, serious juvenile offending accounts for 17% of all violent crimes and 26% of other serious crimes (Federal Bureau of Investigation, 2008). These statistics are concerning because serious juvenile offenders are at high risk of committing criminal offenses in adulthood (Moffitt, Caspi, Harrington, & Milne, 2002) and exact considerable social and economic costs (\$1.3 to \$1.5 million) over their lifetimes (Cohen, 1998). Moreover, as a clinical problem, serious juvenile offending has been linked to increased risk for mental health and interpersonal difficulties for offenders and their victims (Bardone, Moffitt, Caspi, & Dickson, 1996; Moffitt et al., 2002; Shepherd, Farrington, & Potts, 2004). Given the substantial economic impact of crime on society and the negative effects it has on the lives of both offenders and their victims, preventing or attenuating further criminal activity in serious juvenile offenders would favorably affect their lives, families, and communities.

Although mental health and juvenile justice services historically have had little success in ameliorating the serious antisocial behavior of youths (Kazdin, 2000; Tate, Reppucci, & Mulvey, 1995), multisystemic therapy (MST; Borduin & Henggeler, 1990) has proven to be a notable exception. Multisystemic therapy is an intensive family- and community-based treatment that has been shown to reduce juvenile criminal activity in

several randomized clinical trials. For example, Henggeler, Melton, and Smith (1992) found that MST produced a 64% reduction in incarceration at a 59-week follow-up, and Timmons-Mitchell, Bender, Krishna, and Mitchell (2006) found that MST improved youth functioning and decreased recidivism rates at an 18-month follow-up. Furthermore, in a 13.7-year follow-up of the largest randomized clinical trial of MST, Schaeffer and Borduin (2005) demonstrated that MST was more effective than usual services in reducing criminality and incarceration for serious juvenile offenders into early adulthood, when participants were 28.8 years old. Although these and other studies point to the effectiveness of MST with serious juvenile offenders, less is known about the long-term preventive impact of MST on family members of juvenile offenders. The present study will examine the criminal outcomes of nonreferred siblings of serious juvenile offenders who participated in MST an average of 25 years earlier.

Examining the long-term impact of MST on siblings of juvenile offenders is important because they are at increased risk of juvenile and adult criminality (Farrington, 1995; Reiss & Farrington, 1991). Indeed, it is estimated that as much as 50% of the variance in antisocial behavior is accounted for by shared genetic factors (Mason & Frick, 1994). Moreover, environmental factors shared by siblings also have a strong impact on antisocial behavior (Gregory, Eley, & Plomin, 2004; Thapar & McGuffin, 1996). For example, siblings of juvenile offenders often have shared contact with delinquent peers (Bank, Burraston, & Snyder, 2004; Haynie & McHugh, 2003) and shared experience with harsh or hostile caregivers (Conger & Conger, 1994; Patterson, Reid, & Dishion, 1992). In addition, younger siblings of delinquent youths are more likely to have negative (i.e., hostile, coercive, high conflict) relationships with their older

siblings (Garcia, Shaw, Winslow & Yaggi, 2000; Slomkowski, Cohen, & Brook, 1997) and to be exposed to substance use or other delinquent behavior by these siblings (Ardelt & Day, 2002; Snyder, Bank, & Burraston, 2005; Stormshak, Comeau, & Shepard, 2004). To the extent that these shared environmental factors are potentially amenable to treatment, they represent a logical target for intervention developers seeking to prevent delinquency in siblings of juvenile offenders.

Because MST targets causes and correlates of antisocial behavior in a delinquent youth's social ecology, MST should more effectively address delinquency risk factors for the youth's siblings than those treatments that focus primarily on the individual youth. Indeed, MST addresses relationship dynamics between all family members (i.e., caregivers, the targeted delinquent youth, younger and older siblings) and also focuses on pertinent systems outside of the family (i.e., peers, schools, neighborhoods). Accordingly, relative to individually focused treatments, research indicates that MST leads to improved family functioning, improved caregiver and youth mental health, and reduced youth involvement with delinquent peers (Borduin et al, 1995; Huey, Henggeler, Brondino, & Pickrel, 2000). Furthermore, the aforementioned success of MST in reducing youth recidivism may also reduce nonreferred siblings' exposure to modeling of youth delinquent behavior.

There is some evidence that MST and other family-based treatments have positive short-term effects on the siblings of delinquent youths. In a recent study, Rowland, Chapman, and Henggeler (2008) examined preventive treatment effects on closest-in-age siblings of juvenile offenders who were randomly assigned to receive either MST or usual community services. Siblings in the MST condition evidenced a greater reduction

in self-reported substance use at an 18-month follow-up than did siblings in the usual services condition; this reduction in substance use paralleled the treatment effects on substance use in referred siblings in the MST condition. These findings are generally consistent with those of earlier studies examining the short-term effects of behavioral family interventions (Klein, Alexander, & Parson, 1977) and parent training interventions (e.g., Arnold, Levine, & Patterson, 1975; Brestan, Eyberg, Boggs, & Algina, 1997; Brotman et al., 2005) on conduct-disordered and delinquent behavior in nonreferred siblings of antisocial youth. However, it is not known whether these positive short-term effects on sibling behavior persist over longer periods of time.

The present study examined the long-term (i.e., 25.0 years) preventive effects of MST on criminality in nonreferred closest-in-age siblings of serious and violent juvenile offenders. This study investigated the criminal outcomes (i.e., arrests, incarceration) of the closest-in-age siblings of individuals who were referred to receive either MST or usual services (i.e., individual therapy) in the largest randomized clinical trial of MST (see Borduin et al., 1995). More specifically, we explored the long-term effects of MST on the likelihood and number of (a) adult arrests for misdemeanor or felony offenses and (b) years sentenced to incarceration or probation in the adult court system for closest-in-age siblings. To our knowledge, this study represents the most comprehensive and longest follow-up of sibling outcomes of an evidence-based treatment.

CHAPTER II

METHOD

Design

The present study is a long-term follow-up of siblings of juvenile offenders who participated in a clinical trial (Borduin et al., 1995). In the original trial, serious and violent juvenile offenders were randomly assigned to either MST or traditional, office-based individual therapy (IT). A multiagent, multimethod assessment battery was completed for each offender prior to the start of treatment and again after treatment was finished. Juvenile and adult criminal records were examined for each juvenile offender from the time treatment completion to an average of four years later. The present study compared the nonreferred siblings in the MST condition to the nonreferred siblings in the IT condition over an average follow-up period of 25.0 years.

Participants

Original outcome study. The families of juvenile offenders were referred to treatment by juvenile court personnel between July 1983 and October 1986 and agreed to complete pre- and post-treatment assessment measures. Juvenile offenders were on average 14.5 years old ($SD = 1.4$) at time of referral. Inclusion in the original study required that youths (a) have at least two arrests, (b) live with at least one parent figure, and (c) have no evidence of psychosis or dementia. The referred youths had extensive criminal histories, averaging 3.9 previous felony arrests, with 47.8% of the youths having

at least one arrest for a violent crime. The families of youths meeting these criteria were randomly assigned via coin toss to either MST ($n = 92$) or IT ($n = 84$). Of those families assigned to treatment, 140 (79.5%) completed treatment (i.e., *completers*) and 36 (21.5%) dropped out (i.e., *dropouts*), defined as having unilaterally terminated treatment after the first session and before the seventh session. The 36 dropouts included 15 (i.e., 16.3%) of those youths assigned to MST and 21 (i.e., 25.0%) of those youths assigned to IT, a difference that was not statistically significant. Analyses in the proposed study collapsed across completers and dropouts in each condition to provide a conservative test of treatment effects (i.e., intent to treat).

Present study. This study included the sibling who was closest in age to each participant (i.e., juvenile offender) and was living in the same home at the time of in the original clinical trial (Borduin et al., 1995). In those families in which a biological sibling was not present in the home, the closest-in-age child (e.g., step-sibling, cousin, etc.) living in the home was included. Henceforth, for economy of expression, we will use the term “siblings” to refer to closest-in-age siblings, step-siblings, or cousins. Of the families in the original trial, 72.8% (67 of 92) of families in the MST condition and 73.8% (62 of 84) of families in the IT condition had a nonreferred sibling in the home.

The mean age of the juvenile offenders (i.e., those with siblings in the original clinical trial) and their closest-in-age siblings were 14.5 years ($SD = 1.4$) and 13.4 years ($SD = 3.7$) respectively. Of the closest-in-age siblings, 60.0% were younger siblings, 38.2% were older siblings, and 1.8% were twins. More than half (69.3%) of the juvenile offenders and exactly half (50%) of the siblings were boys (30.7% and 50% were girls, respectively). The majority of youth lived in two-parent households (59.1%) and in

families of low socioeconomic status (63.4%; Class IV or V; Hollingshead, 1975); 79.1% were White and 20.9% were African American. *T*-tests and chi-square tests revealed that siblings in the two treatment conditions (MST vs. IT) did not significantly differ in terms of age at time of treatment, sex, number of parents in the home, socioeconomic status (SES; Hollingshead, 1975), or length of follow-up,.

Treatment Conditions

Families who agreed to complete a pretreatment assessment and also agreed to participate in treatment were randomly assigned to treatment conditions. The mean number of hours of treatment was 20.7 (*SD* = 7.4) for MST and 22.5 (*SD* = 10.6) for IT; these means did not differ significantly.

MST. Interventions were based on the multisystemic conceptualization of the treatment of antisocial behaviors in youth (Henggeler & Borduin, 1990). The emphases of MST interventions are consistent with the empirical causes and correlates of antisocial behavior in youth (see Loeber & Farrington, 1998) and with social-ecological and systemic conceptualizations of antisocial behavior (e.g., Bronfenbrenner, 1979). Treatment is present-focused and action-oriented with specific, well-defined goals. MST addresses both intrapersonal (e.g., cognitive) and systemic (e.g., family, school, peer) influences on youth antisocial behavior. MST interventions are individualized and flexible to account for the specific combination of influences identified in each case. Moreover, interventions are guided by a set of treatment principles that emphasize (a) the fit between problem behaviors and their systemic and developmental contexts, (b) the use of individual and family strengths in promoting responsible behavior, (c) therapist accountability, and (d) treatment generalization and sustainability.

Consistent with family preservation models of service delivery (Fraser, Nelson, & Rivard, 1997) and to enhance engagement and generalization, MST treatment sessions were usually held in clients' homes and other ecological settings (e.g., school, neighborhood). Services were time-limited and intensive and had the stated goal of empowering caregivers to deal with the inevitable difficulties that arise in raising adolescents.

IT. Interventions in this condition were selected to represent the usual community-based treatment for juvenile offenders within the local judicial district. IT usually focused on personal, family, and academic issues. The therapists offered support and feedback for behavior change. Interventions included an eclectic blend of theoretical perspectives, including psychodynamic, client-centered, and behavioral approaches. The common thread among the varying IT interventions was that treatment focused almost exclusively on the individual adolescent as opposed to the adolescent's social systems.

Therapists

MST in the original study was provided by three male and three female clinical psychology graduate students ranging in age from 23 to 31 years ($M = 26$). Each had approximately 1.5 years of prior clinical experience with youths prior to the study and served as therapists in the study for 12 to 24 months ($M = 16$). MST supervision was provided by C. M. Borduin in a 3-hour weekly group supervision meeting throughout the course of the study. During supervision meetings, the supervisor and therapists reviewed videotapes of therapy meetings, discussed therapeutic goals, and decided how to best facilitate the family's progress.

IT in the original study was provided by three female and three male therapists (ages ranged from 25 to 33 years; $M = 28$) at local outpatient mental health agencies, including the treatment services branch of the juvenile court. Each therapist had approximately 4 years of clinical experience with youths prior to the study and held a master's degree or equivalent training in counseling psychology, social work, or another mental health-related field. IT therapists voluntarily served in the clinical trial for 11 to 28 months ($M = 17$). These therapists attended a 2.5-hour weekly case review with the treatment coordinator from the juvenile court to discuss the goals and progress of each case.

Treatment Integrity

To sustain the integrity of MST, therapists documented each therapeutic contact by summarizing what transpired and how much progress had been made in meeting the goals of treatment; ongoing clinical supervision and feedback were provided throughout the investigation. To monitor the integrity of IT, therapists were required to provide monthly reports that summarized the nature of therapeutic contacts, who was present at contacts, and adolescent progress in meeting the goals of treatment. The project director (C. M. Borduin) met periodically with the therapists to review selected videotapes of treatment sessions and to ensure that the therapists adhered to their stated treatment plans. Adherence to treatment plans was also promoted by the juvenile court treatment coordinator for IT therapists. Although it was not possible to include an independent assessment of the integrity of either MST or IT, the therapists in both conditions completed a checklist for each of their cases to indicate the systems directly addressed during the course of treatment (i.e., individual, marital, family, peer, school). These

checklists revealed that all MST participants received interventions in two or more systems ($M = 3.5$), whereas the vast majority (90.5%) of IT cases received interventions in only one system (always the individual adolescent).

Research Procedures

Original outcome study. Families referred to the treatment project were initially contacted via phone or home visit and told that a 1.5-hour research assessment would be conducted prior to the start of treatment and again after all treatment sessions were completed. Referred families were told that participation in the research was voluntary and that refusing to participate or discontinuing participation would neither jeopardize the receipt of treatment services nor result in sanctions from the court. Families were also informed that juvenile arrest records would be collected through youths' 17th birthdays and that adult arrest records and other public records would be obtained for family members thereafter. Parents provided written consent, and youths and their siblings provided written assent for the research procedures. All procedures were approved by the Institutional Review Board of the University of Missouri.

Present study. Criminal court records are publically available in the state of Missouri and were obtained for the closest-in-age sibling to the referred youth. A broader search of criminal records in other states was not possible because fingerprints would have been required to conduct a national criminal records search, and these were not obtained from juvenile offenders or their siblings at the time of the original study. Nevertheless, it was assumed that arrest rates for those siblings residing outside of Missouri did not differ systematically from those siblings remaining in the state. We also

assumed that variation between treatment groups in arrest rates were consistent whether the sibling resided within or outside of Missouri.

In the present study, Missouri residency was confirmed using the same procedures as Schaeffer and Borduin (2005) to determine whether siblings resided in the state during the follow-up period. Several steps were used to confirm residency. First, state criminal records were searched, and adult arrests that had occurred since the original clinical trial were noted. Next, for those siblings whose names did not appear in state criminal records, a search of state driving records was conducted. An individual was considered to have resided in the state during the follow-up period if he or she was convicted of a driving violation. Finally, property ownership and marital records were searched for siblings for whom there were no arrest or driver's license records.

Overall, 85.3% ($n = 110$) of the nonreferred siblings were located and determined to have lived in the state since the follow-up period. The number and percentage of siblings found in each treatment group were as follows: MST ($n = 60$, or 89.6%) and IT ($n = 50$, or 80.6%). Those youths ($n = 19$) who could not be verified to live in the state were considered lost to long-term follow-up and were not included in subsequent analyses.

Measures

Adult criminal court records were searched using an Internet database. Available adult records included all Missouri court cases between 1985 and the present. Siblings' names were used to search court records, including known aliases, alternative first names (e.g., Christy or Tina for Christina), and alternative last names for women whose names

may have changed due to marriage (based on state-level court records and county-level marriage records).

Several steps were taken to reduce the possibility of false positives for siblings whose names were present in court records. First, siblings were matched to records by date of birth, middle name or middle initial, and suffixes (e.g., Jr.). Second, when such indicators were absent for a specific case, siblings were matched to records based on similarities to cases that met the first search criterion, including previously recorded addresses, court locations, and names of other individuals listed on the court docket (e.g., spouses, individuals involved in paternity cases). If siblings could not be matched to records by this ruling out process, no information was recorded for a given sibling. For criminal records, data were coded by crime classification (misdemeanor vs. felony) and date of referral. In addition, sentencing information was recorded as the number of days sentenced to incarceration and/or probation.

CHAPTER III

RESULTS

Likelihood and Relative Odds of Arrests

As noted previously, treatment completers and dropouts were collapsed within each group. To describe the relative likelihood of arrests in the IT group versus the MST group, we performed chi-square tests. At 25.0 years of follow-up, the overall arrest rate for the MST group (43.3%) was significantly lower than the overall rate for the IT group (72%), $\chi^2(1, N = 110) = 4.65, p < .05$. Between-groups differences in recidivism rates for felonies and misdemeanors are described in Table 1.

To describe the relative risk of arrest in the IT group versus the MST group, we calculated odds ratios by dividing the odds of recidivism (i.e., % arrested divided by % not arrested) for IT participants by the odds of recidivism for MST participants. Odds ratios greater than 1.0 indicated a higher risk for IT participants relative to MST participants, and confidence intervals that did not include 1.0 indicated that results were unlikely to occur by chance (Cohen, 1994). The results showed that siblings in the IT group were 3.36 times more likely than siblings in the MST group to be arrested for any offense (95% confidence interval [CI] = 1.52-7.49) during the follow-up period. More specifically, IT youths were 2.92 times more likely to have an arrest for a felony (95% CI = 1.17-7.32) and 2.63 times more likely to have an arrest for a misdemeanor (95% CI = 1.21-5.68).

Survival Functions for Arrests

Survival analyses (SPSS, Version 15) were used to obtain cumulative survival functions (or survival curves) for criminal outcomes among siblings in the MST and IT groups. The cumulative survival function represents the proportion of siblings who survived any type of arrest (i.e., were not arrested) in each group by the length of time (in years) from release from treatment. Survival analyses are appropriate here because they model data that are censored, (i.e., when some individuals in the sample do not experience an event, such as arrest; Keiley & Martin, 2005). A log-rank test revealed that the survival functions for the two groups were significantly different, $\chi^2(1, N = 110) = 8.35, p = .004$. As depicted in Figure 1, MST siblings were at lower risk of arrest (i.e., more likely to survive) during follow-up than were IT siblings. By the end of 25.0 years, 72.0% of the siblings in the IT group had been arrested at least once, compared with 43.3% of the siblings in the MST group. To determine an effect size for this survival function, we performed a Cox proportional hazards regression (Cox, 1972). The hazards ratio for treatment condition (MST or IT; $p = .005$) was .491, suggesting a medium effect size for the lower risk of arrest observed for MST siblings.

Another set of survival analyses was conducted to examine between-groups differences on time to first arrest for different types of offenses. As depicted in Figures 2 and 3, respectively, siblings in the MST group were at lower risk of arrest for felony offenses, $\chi^2(1, N = 110) = 3.22, p = .07$, and misdemeanor offenses, $\chi^2(1, N = 110) = 5.71, p = .02$, during follow-up than were siblings in the IT group. The hazards ratios for these survival functions suggested medium effects for MST on felonies ($\beta = .495, p = .08$) and misdemeanors ($\beta = .531, p = .02$) respectively.

Number of Arrests and Years Sentenced

Zero-Inflated Poisson (ZIP) regression analyses evaluated the impact of treatment condition on the number of (a) posttreatment arrests and (b) years sentenced to incarceration or probation.¹ All ZIP regressions were computed using the Mplus (Version 4) statistical package and used maximum likelihood estimation. Treatment condition was dummy coded (IT equal to 1 and MST equal to 0). Descriptive statistics and regression coefficients are presented in Table 2.

We calculated an odds estimate (*OE*) and rate estimate (*RE*) for each outcome variable. The estimates of odds indicated that IT siblings were more than three times as likely as MST siblings to have been arrested for any offense (*OE* = 3.49), almost five times as likely to have been arrested for a felony (*OE* = 4.80), and more than twice as likely to have been arrested for a misdemeanor (*OE* = 2.54). In addition, IT siblings were twice as likely to be sentenced to incarceration and probation. Regarding rates, IT siblings were estimated to be sentenced to approximately 11 times as many years of incarceration and 7 times as many years of probation as were MST siblings (*REs* = 11.5 and 6.95 respectively). Although all other *RE* values favored MST over IT, none were statistically significant.

CHAPTER IV

DISCUSSION

The present study represents the longest and most comprehensive follow-up to date of the effects of a family-based treatment on siblings of juvenile offenders. The results indicated that, over a follow-up period of 25.0 years, siblings of MST participants were significantly less likely to have been arrested than were siblings of IT participants (43.3% vs. 72.0%, respectively). In addition, the odds of arrest for felony or misdemeanor offenses were 2-3 times lower for siblings of MST participants than for siblings of IT participants. Moreover, siblings in the IT condition were more than twice as likely to have been sentenced to incarceration or probation and were estimated to have been sentenced to 7-11 times as many years of incarceration and probation.

The outcomes of this study are the first to demonstrate the long-term efficacy of MST in altering the criminal trajectories of siblings of serious juvenile offenders beyond adolescence (see Rowland & Henggeler, 2008) and into middle adulthood. Indeed, these results indicate a 40% reduction in overall arrest rates and a 55% reduction in felony arrest rates for those siblings in the MST condition when compared to siblings in the IT condition. Although the juvenile arrest histories were unknown for these siblings, the vast majority (i.e., 72%) of siblings in the IT condition had at least one adult arrest, and a substantial portion (i.e., 34%) had at least one felony arrest. Therefore, it is plausible that some of these siblings are life-course-persistent offenders (see Moffit, 1993) and account

for a disproportionate amount of crime in their communities. These findings are potentially important for other family-based treatments (e.g., Multidimensional Treatment Foster Care [Chamberlain, 2003]; Functional Family Therapy [Alexander & Parsons, 1982]) for juvenile offenders inasmuch as their treatment effects may also generalize to other children or adolescents in the family. We hope to conduct a more comprehensive follow-up with the current sample to determine whether the long-term positive effects of MST extend to caregivers and other siblings of juvenile offenders.

The reductions that were observed in sibling criminality in the present study are consistent with the two main components of the MST theory of change (see Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009). First, MST targets a complex interplay of risk factors (e.g., access to delinquent peers, modeling of antisocial behavior) that exist in the multiple systems (e.g., family, neighborhood) that are shared by identified youth and their siblings. By effectively addressing these shared risk factors, MST may lower the continuing risk of future offending for both offenders and their closest-in-age siblings. Second, MST focuses on caregivers as the primary conduits of change. Therefore, as caregivers learn skills and gain resources to assist in effectively parenting identified youth, they may apply these same techniques to all of their children. If caregivers are empowered to make changes in parenting (e.g., increased monitoring), family relations (e.g., reduced conflict), youth peer relations (e.g., increased contact with prosocial peers), and youth school performance (e.g., increased attendance), then nonreferred siblings may be exposed to and benefit from these improvements both during and after treatment. Furthermore, given that usual services for juvenile offenders typically neglect the caregiver's role in promoting long-term change, focus primarily on

the identified youth, and fail to target a broad range of risk factors, it should not be surprising that the siblings in the IT condition fared poorly. However, in the absence of mediational analyses, we cannot confirm the processes by which MST leads to reductions in sibling criminality.

The relative efficacy of MST in reducing sibling criminality and incarceration has important implications for policymakers and administrators. Given the scarcity of resources available to treat serious juvenile offenders and the rising costs associated with law enforcement, the legal system, and the penal system, policymakers and mental health administrators would benefit from considering clinically effective interventions that are also cost effective. A recent cost analysis, based on reductions in crimes for offenders who participated in MST, estimated that MST resulted in savings to taxpayers and crime victims from \$75,110 to \$199,374 per youth over a 13.7-year follow-up period (Klietz, Borduin, & Schaeffer, 2010). Findings from the present study regarding reductions in criminality for closest-in-age siblings should result in even greater cost savings for MST than those demonstrated by Klietz et al., suggesting that family-based treatment such as MST are a bargain in the treatment of serious juvenile offenders.

The present study has several methodological limitations. First, we assessed criminal activity during the follow-up period using official arrest records, which are believed to underestimate the actual number of crimes committed by serious offenders (Loeber & Farrington, 1998). However, arrest records are one useful index of criminal involvement and likely resulted in an accurate estimate of the relative effectiveness of MST versus IT in reducing criminal activity. Second, we were unable to confirm that youths maintained continuous residency in Missouri throughout the follow-up period and

cannot rule out the possibility that a portion of youths may have committed crimes in other states. However, it seems unlikely that length of residency in the state would vary systematically across treatment groups. Moreover, complete follow-up data were available for the vast majority (85.3%) of our sample. Third, we examined arrest records for the closest-in-age sibling of each juvenile offender but not for other siblings. Because the number of siblings in each family varied considerably, expanding our evaluation of sibling outcomes beyond closest-in-age siblings would have substantially reduced our sample size. In addition, siblings who are close in age are more likely to share similar risk factors for antisocial behavior than are siblings with wider age spacing and, thus, may be most likely to benefit from MST-related changes in their social ecologies (e.g., improvements in family functioning, decreases in delinquent peer affiliation, better grades in school).

In conclusion, the results of this study create a persuasive argument for increased implementation of MST and other evidence-based family interventions for serious juvenile offenders and decreased use of individually focused interventions. This increase in implementation would result in reductions in criminality for offenders and their nearest-in-age siblings, increases in the efficiency of how taxpayers' dollars are spent (Klietz et al., 2010), and decreases in the social problems associated with victimization. Mental health policymakers, administrators, and providers should consider whether evidence-based family treatments have benefits for other family members when selecting interventions for serious juvenile offenders. In future research, it would be informative to examine MST effects on other family members besides closest-in-age-siblings (e.g.,

parents) and other areas of sibling adjustment (e.g., educational attainment, family and financial stability).

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Table 1

Likelihood of Posttreatment Arrests and Sentences by Therapy Condition

Variable	%	$\chi^2(1)$	<i>p</i>
Criminal arrests			
Any Crime		10.52	.002
IT	72.0		
MST	43.3		
Any Felony		6.18	.013
IT	34.0		
MST	15.0		
Any Misdemeanor		6.85	.009
IT	62.0		
MST	38.3		

Note. Sample sizes for therapy conditions are as follows: individual therapy (IT; $n = 50$); multisystemic therapy (MST; $n = 60$).

Table 2

Descriptive Statistics and ZIP Regression Results for Criminal Outcomes

Variable	MST		IT		ZIP Coefficients	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>OE</i>	<i>RE</i>
Offense type (number)						
Any offense	1.33	2.24	2.46	3.63	3.49*	3.29
Any felony	0.38	1.14	0.58	0.93	4.80**	1.18
Any misdemeanor	0.95	1.62	1.88	3.08	2.54*	2.86
Adult sentencing (years)						
Incarceration	1.69	6.00	2.31	3.93	2.46*	11.5*
Probation	1.35	2.76	3.36	5.02	2.31*	6.95**

Note. ZIP = Zero-Inflated Poisson; *OE* = odds estimate; *RE* = rate estimate; IT = individual therapy; MST = multisystemic therapy. For all analyses, only those youths with complete 25.0-year follow-up data were included, and completers and dropouts within each treatment condition were combined. Sample sizes for therapy conditions are as follows: IT ($n = 50$); MST ($n = 60$).

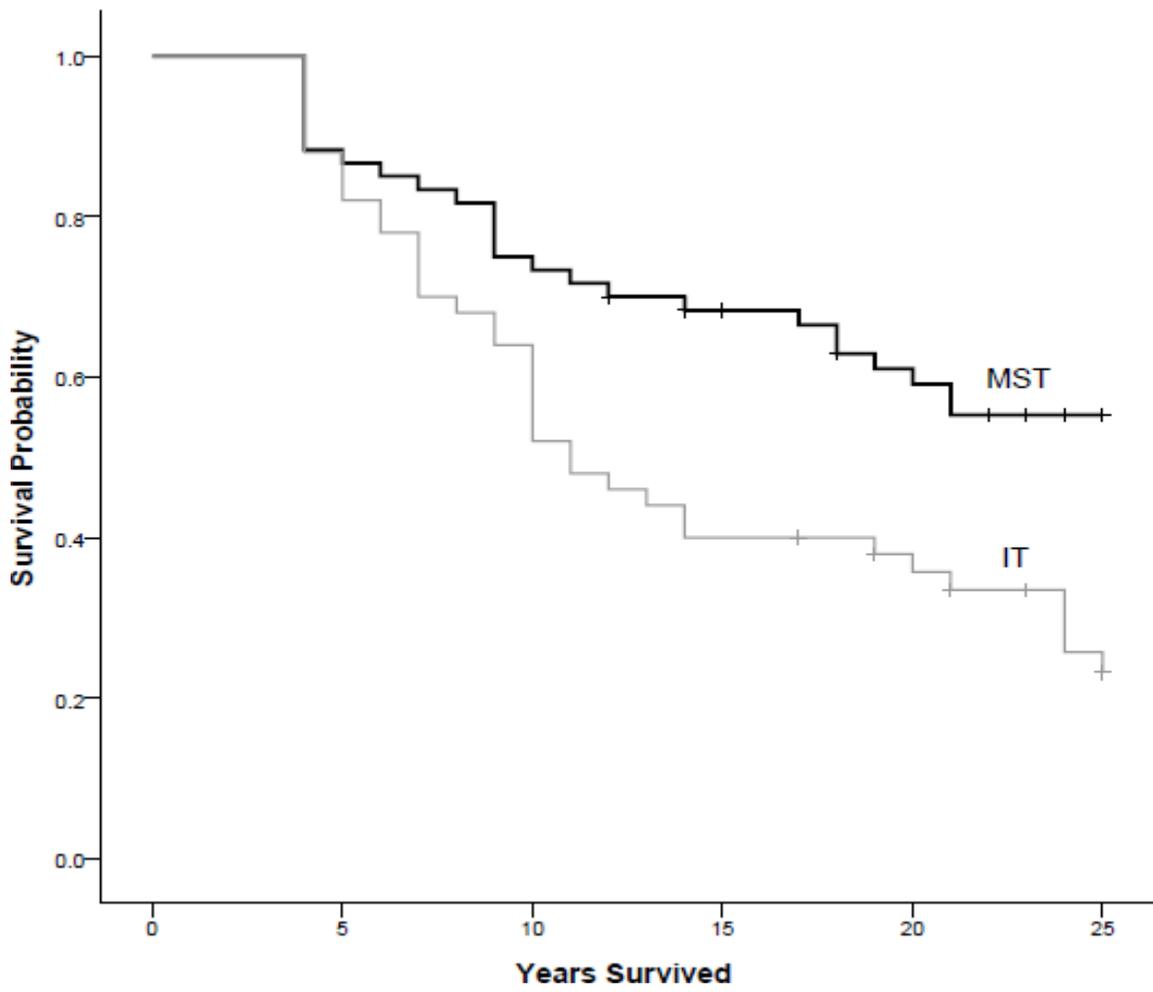
* $p < .05$, ** $p < .01$.

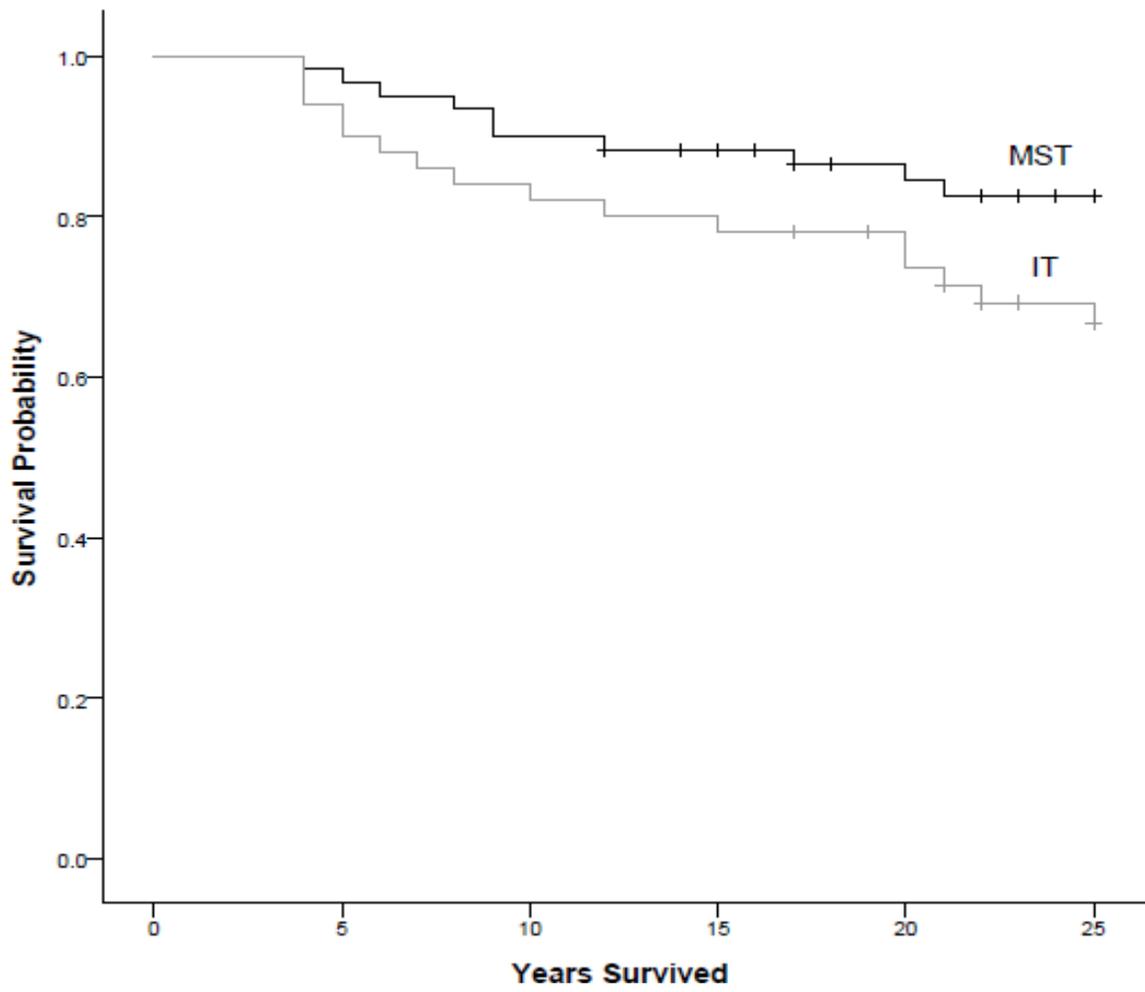
Figure Captions

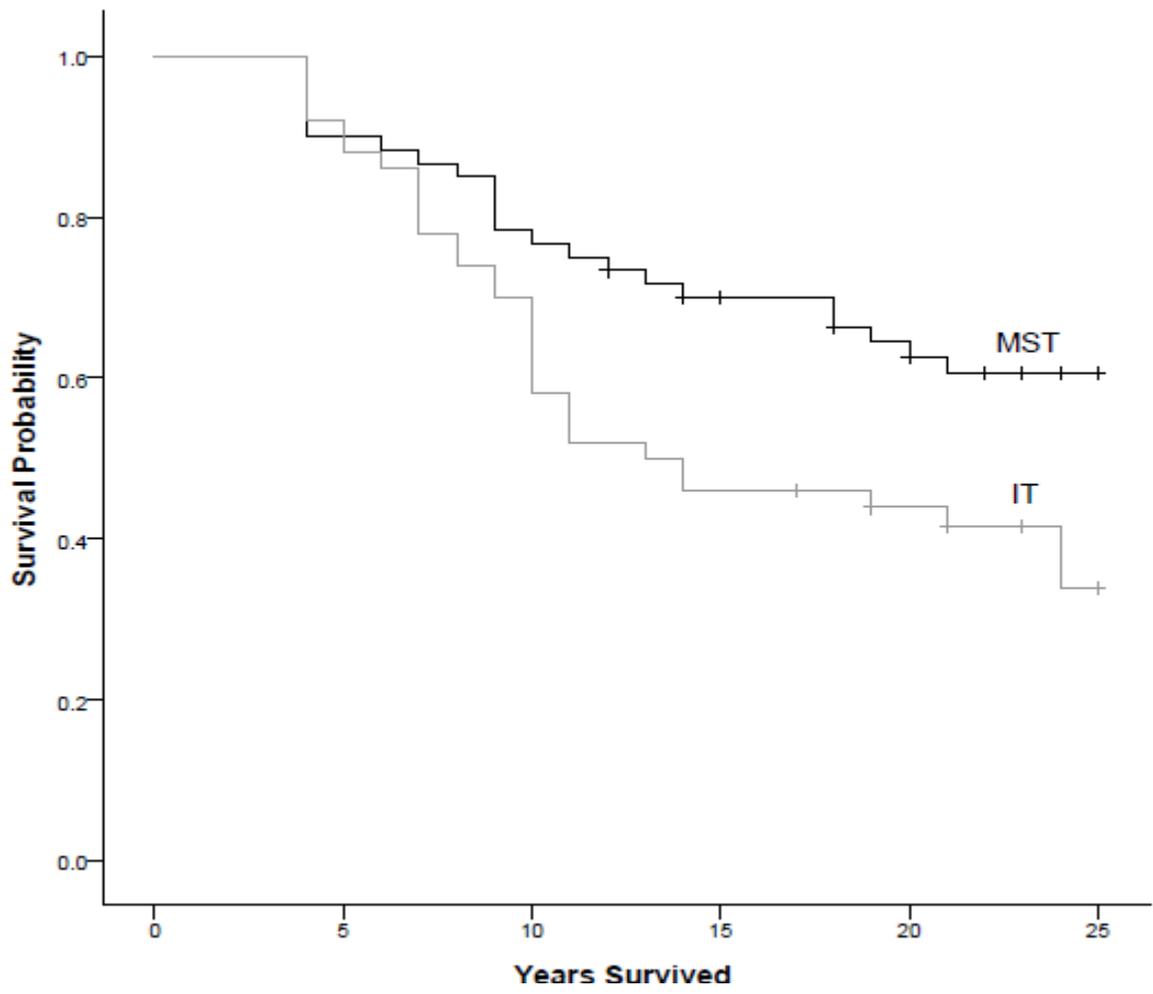
Figure 1 Survival functions for multisystemic therapy (MST) and individual therapy (IT) groups on time to any first arrest following treatment.

Figure 2. Survival functions for multisystemic therapy (MST) and individual therapy (IT) groups on time to first felony arrest following treatment.

Figure 3. Survival functions for multisystemic therapy (MST) and individual therapy (IT) groups on time to first misdemeanor arrest following treatment.







Footnotes

1. Because the outcome variables in the present study are continuous, non-normal, and non-negative (i.e., there are no negative values), they are considered censored-dependent variables (Greene, 1993). These variables contain both qualitative (e.g., arrested vs. not arrested) and quantitative (e.g., number of arrests among recidivists) components. ZIP regressions account for the qualitative and quantitative components of such variables by producing two separate estimates: (1) an estimate of relative odds (e.g., of being arrested), and (2) an estimate of relative rate (e.g., of number of arrests). Both estimates differ from traditional odds and rate statistics in that they are inferential estimates of effect rather than descriptive statistics. ZIP regressions perform well when sample distributions of counts are highly skewed due to an excess of zeroes (e.g., individuals with no criminal convictions; Lambert, 1992).