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Multisystemic Therapy for Child Non-Externalizing Psychological and Health Problems: A Preliminary Review

Heather T. Pane,
Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, 1977 Butler Blvd., Suite E4.400, Houston, TX 77030, USA. DePelchin Children's Center, 4950 Memorial Drive, Houston, TX 77007, USA

Rachel S. White,
Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, 1977 Butler Blvd., Suite E4.400, Houston, TX 77030, USA. Department of Pediatrics, Adolescent Medicine, Baylor College of Medicine, 6701 Fannin St., Houston, TX 77030, USA

Michael R. Nadorff,
Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, 1977 Butler Blvd., Suite E4.400, Houston, TX 77030, USA. Department of Psychology, Mississippi State University, 110 Magruder Hall, 255 Lee Blvd, Starkville, MS 39762, USA

Amie Grills-Taquechel, and
Boston University, School of Education, Two Silber Way, Boston, MA 02215, USA

Melinda A. Stanley
Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, 1977 Butler Blvd., Suite E4.400, Houston, TX 77030, USA. Houston VA HSR&D Center of Excellence (152), Michael E. DeBakey VA Medical Center (MEDVAMC), 2002 Holcombe Blvd., Houston, TX 77030, USA. VA South Central Mental Illness Research, Education and Clinical Center, Houston, TX, USA

Heather T. Pane: htpane@gmail.com

Abstract

Multisystemic therapy (MST) is effective for decreasing or preventing delinquency and other externalizing behaviors and increasing prosocial or adaptive behaviors. The purpose of this project was to review the literature examining the efficacy of MST for other child psychological and health problems reflecting non-externalizing behaviors, specifically difficulties related to child maltreatment, serious psychiatric illness [Serious psychiatric illness was defined throughout the current review paper as the "presence of symptoms of suicidal ideation, homicidal ideation, psychosis, or threat of harm to self or others due to mental illness severe enough to warrant psychiatric hospitalization based on the American Academy of Child and Adolescent Psychiatry (Level of care placement criteria for psychiatric illness. American Academy of Child and Adolescent Psychiatry, Washington, DC, 1996) level of care placement criteria for psychiatric illness" (Henggeler et al. in J Am Acad Child Psy 38:1331–1345, p. 1332, 1999b). Additionally, youth with "serious emotional disturbance (SED)" defined as internalizing and/or externalizing problems severe enough to qualify for mental health services in public school who were "currently in or at imminent risk of a costly out-of-home placement" (Rowland et al. in J Emot Behav Disord 13:13–23, pp. 13–14, 2005) were also included in the serious psychiatric illness category.], and

Correspondence to: Heather T. Pane, htpane@gmail.com.

health problems (i.e., obesity and treatment adherence for diabetes). PubMed, Web of Science, MEDLINE, and PsycINFO databases; Clinicaltrials.gov; DARE; Web of Knowledge; and Cochrane Central Register of Controlled Trials were searched; and MST developers were queried to ensure identification of all relevant articles. Of 242 studies identified, 18 met inclusion criteria for review. These were combined in a narrative synthesis and critiqued in the context of review questions. Study quality ratings were all above mean scores reported in prior reviews. Mixed support was found for the efficacy of MST versus other treatments. In many cases, treatment effects for MST or comparison groups were not sustained over time. MST was efficacious for youth with diverse backgrounds. No studies discussed efficacy of MST provided in different treatment settings. Four studies found MST more cost-effective than a comparison treatment, leading to fewer out-of-home placements for youth with serious psychiatric illness or lower treatment costs for youth with poorly controlled diabetes.

Keywords

Multisystemic; Treatment; Internalizing; Maltreatment; Health problems

Introduction

Multisystemic Therapy (MST) is a revolutionary treatment for child externalizing mental health problems (e.g., Borduin 2009; Henggeler et al. 1992, 2009) that is based on an ecological model of treatment that views each child as part of a network of multiple systems that interact to influence behavior. The systems within this multisystemic approach include the child or individual, family, peers, school, neighborhood, and community or overarching culture.

Initially designed to target youth with antisocial behaviors (Painter 2010), MST has the goals of decreasing these and other delinquent behaviors (e.g., substance abuse; referred to throughout this manuscript more generally as “externalizing” disorders or populations) and reducing rates of out-of-home placement (e.g., foster care) and incarceration (Curtis et al. 2004). To meet these goals, MST therapists seek to promote familial and other supportive relationships, parenting skills, youth involvement in positive activities and friendships, and success at school (Curtis et al. 2004). Intervention strategies used within the MST framework include a combination of empirically supported, problem-focused treatment components tailored to the needs of the individual child and family, which are collaboratively determined by the therapist and the family (Henggeler et al. 2009). For example, cognitive-behavioral strategies, parent management training, and systemic family therapy may be employed (Henggeler 1999). Traditionally, treatment services within MST include an initial evaluation to determine goals of MST for the family, individual therapy with the youth and his/her family, peer interventions, crisis stabilization, and case management.

In addition to focusing on both the individual and broader systems (family, school, community), MST is also culturally minded (Painter 2010) and addresses certain barriers to treatment access by providing treatment in homes, schools, and other community settings (Tolman et al. 2008). MST is truly ideographic in its approach, with arrangements made to suit each individual family; for instance, by scheduling meetings at times convenient to each family. This is also in keeping with one of the primary rationales for providing treatment in the natural environment, which is to increase the likelihood of treatment adherence, and generalization and maintenance of positive skills and changes (Henggeler 1999).

Given the intensity of treatment provided, each MST therapist maintains a small caseload with between four to six families. Treatment usually lasts for three to five months with therapists providing around-the-clock support, as necessary, and an average of up to 60 hours of direct contact with each family (Multisystemic therapy: An overview 2007).

Studies examining MST generally emphasize high external validity or generalizability, utilizing limited exclusion criteria, involving multiple treatment components and systems, and including youth with a wide range of co-occurring problems or disorders (Henggeler 2011). As such, the majority of MST studies have been considered efficacy-effectiveness hybrids (Henggeler 2011; Schoenwald et al. 2003), with differential focus placed on either efficacy or effectiveness. The hybrid studies with a focus on efficacy have generally been conducted with graduate student therapists in a university setting. Under these conditions, MST has been found to lead to decreases in delinquent behaviors, such as sexual offenses (Borduin et al. 2009), criminal activities (Henggeler et al. 1999), and other externalizing behaviors (e.g., substance abuse; Henggeler et al. 1999). Studies with greater attention to effectiveness involve community-based therapists in either a community or university setting. Under these conditions, MST has been shown to promote increased school involvement (Brown et al. 1999), decreased externalizing or antisocial behaviors among youth (e.g., Ogden and Halliday-Boykins 2004), and increased prosocial or adaptive behaviors, such as improved peer and family relations (e.g., Henggeler et al. 1992). Of note, average treatment effect size has been greater when MST has been provided by graduate student therapists ($d = .81$) as compared to community-based therapists ($d = .27$) (Curtis et al. 2004). Such differential effect sizes are common in treatment outcome research (e.g., Curtis et al. 2004, 2009) and may be due to unique design characteristics of studies that emphasize efficacy versus effectiveness; for example, investigators have a greater ability to control potentially confounding variables in efficacy-focused studies (graduate student therapists in a university setting). In any case, MST in its true form in the community attempts to address these challenges by setting up a hierarchy of oversight and supervision for therapists through the MST network (Henggeler et al. 2009).

As evidence has accumulated for MST's positive effects for severe externalizing problems, so has interest in this intervention for a broad array of other child psychological and health problems. Beyond its effectiveness with externalizing disorders, there are several reasons researchers appear to be drawn to this approach. First, MST is founded on principles from Bronfenbrenner's (1979) ecological systems theory, making it enticing for the treatment of a diverse array of child psychological and health problems. Similar to externalizing problems, other problems among youth, including child maltreatment, internalizing (e.g., depression, suicidality), and health problems (e.g., obesity), are affected by and affect multiple systems in the youth's environment. For instance, these problems are often linked to modifiable factors related to the individual youth, parent, and family systems (e.g., disturbances in child–parent interactions or relationships, peer relationships, schools, and neighborhoods; low family engagement and resources to support youth; Henggeler et al. 1999). As such, clinicians and investigators who conceptualize youth problems from a social ecological perspective would likely consider a multisystemic approach in treatment of any of these difficulties. In fact, these non-externalizing problems have already begun to receive attention as possible treatment targets for MST. Second, since MST has shown positive outcomes with severe externalizing disorders that are often considered among the most difficult to treat, researchers may be interested in attempting to replicate these outcomes with other complex disorders (e.g., severe depression, anxiety, or psychosis) that also involve problems within various systems of the ecology. In addition, among youth experiencing certain non-externalizing problems (e.g., severe psychiatric illness), there are high rates of co-occurring externalizing problems, which lends support for MST as treatment for these youth. Similar to less severe cases of externalizing behavior problems, MST may not always be the first, or

even second, line of treatment for non-externalizing psychological or health-related problems; however, in more complex, treatment resistant or intractable cases it may be greatly beneficial for promoting treatment success or prevention of relapse. For instance, support has been demonstrated for a number of cognitive-behavioral interventions for anxiety disorders that can be conducted with less intensity, effort, and cost than MST. Thus, a typical case presenting with an anxiety disorder would have one of these interventions (e.g., the Coping Cat, Kendall and Hedtke 2006) as its first-line treatment. However, some youth are unable to receive such treatment due to complexities or barriers to access within various systems of their ecology, including difficulties related to poverty (e.g., problems with transportation; parent work schedule conflicts) or involvement in the child welfare system (e.g., limited transportation and time availability due to youth placement in foster home, particularly in homes with multiple children; multiple changes in placement). In other cases, certain youth may receive evidence-based treatment for anxiety in an outpatient setting but remain resistant to treatment due to systemic problems (e.g., familial conflict; parent mental health problems; severe symptoms leading to difficulties leaving the home to attend sessions). Finally, similar to youth externalizing disorders, severe or treatment resistant non-externalizing conditions are associated with high costs to individuals, families, and society (e.g., Lynch and Clarke 2006). These costs may include not only lifetime healthcare dollars, but also personal and societal costs related to school dropout, later unemployment and/or disability, other difficulties within financial, occupational, legal, and social domains, and loss of life in certain cases. MST offers a potentially cost-effective option for intervening with these difficult cases. For instance, in one study of externalizing problems, MST was associated with greater treatment outcomes (decreased criminality) for juvenile delinquents per each dollar spent (Klietz et al. 2010). For each MST participant, overall benefits ranged from $75,110 to $199,374 ($9.51–$23.59 per treatment dollar spent), which included reduction in intangible costs for crime victims and expenses for taxpayers. Thus, these and other beneficial aspects of MST make it appealing to intervention researchers across a broad array of domains.

Nonetheless, while much is known about the efficacy and effectiveness of MST for delinquent and externalizing youth populations, less is known about the efficacy and effectiveness of this treatment for non-externalizing psychological and health populations. Two previous literature reviews have examined MST for both child externalizing (antisocial or delinquent behaviors) and other mental health problems (Curtis et al. 2004; Painter 2010). Findings suggested that MST is efficacious for treatment of not only externalizing (e.g., delinquency, substance abuse) but also certain non-externalizing youth problems, specifically, suicidal ideation and/or behaviors, psychosis, internalizing problems (comorbid with externalizing problems), or child maltreatment (Curtis et al. 2004; Painter 2010). While these reviews provided important summaries of these studies, neither provided ratings on the quality of studies reviewed. In literature reviews, the report of study quality is important to provide information about the validity of reviewed studies and related findings (e.g., Khan et al. 2000). Specifically, higher-quality studies garner greater emphasis in discussions aimed at providing recommendations for future research. Additionally, both Curtis et al. (2004) and Painter (2010) reviewed studies published prior to 2003 and 2009, respectively, and examined MST in the treatment of externalizing behaviors and only a limited set of non-externalizing behaviors (as noted above). Neither review included studies of MST for youth health problems and both omitted studies conducted since 2009, a total of four studies to date. Finally, to date, studies have largely focused on cost-effectiveness of MST for treatment of delinquent or other externalizing problems. Given the intensive effort (e.g., hours, clinician training) involved with MST, it is important to consider cost-effectiveness to better understand treatment effectiveness or implementation feasibility of this intervention for non-externalizing psychological or health problems.

The purpose of the current project was to review the literature examining the efficacy and effectiveness of MST for non-externalizing child psychological and health problems, specifically, difficulties related to child maltreatment, serious psychiatric illness[1], and behavioral medicine or health problems, which will be defined in the results section. Studies that emphasized efficacy or effectiveness features, as well as pilot studies, were included to provide the broadest possible evaluation of MST utility and the current scope of the studies conducted in these domains. This review also rates quality of included studies and sought to answer the following three questions:

1. Has MST been shown to be efficacious or effective in decreasing symptoms and/or promoting positive outcomes for youth in studies conducted on the non-externalizing psychological and health problems specified above?
2. If so, for which specific populations or demographics and in which settings is MST efficacious or effective when used to treat these specific non-externalizing psychological and health problems?
3. Is MST cost-effective for treating these specific non-externalizing psychological and health problems?

Method

Literature Search Strategies

Literature searches were conducted via PubMed, Web of Science, MEDLINE, and PsycINFO databases for published articles related to the questions posed by the current review. Clinicaltrials.gov, DARE, Web of Knowledge and Cochrane Central Register of Controlled Trials (CENTRAL) also were searched for ongoing or completed studies or review articles focused on MST. Finally, the MST website was reviewed and the MST developers contacted to ensure that all relevant articles were identified. Articles that were searched spanned from 1985 through 2011. Search terms contained *multisystemic therapy* with combinations of other terms, including *abuse, neglect, maltreatment, bipolar, depression, anxiety, post-traumatic stress, obsessive–compulsive, fear, specific phobia, separation anxiety, social phobia, generalized anxiety, internalizing, pediatric, health problems, prevention, outcome, component, continuum, culture, populations, setting*, and *outpatient*. Searches also included review of the reference sections of relevant articles for other studies that might meet inclusion criteria.

Inclusion and Quality-Rating Procedure

Studies included in this review met the following criteria: (1) original empirical research—a randomized controlled trial (RCT) or quasi-experimental study (i.e., lacking one or more RCT requirements: pre–post test design, both treatment and control groups, and/or random assignment of study participants); (2) inclusion of MST as the/a treatment of interest; (3) total $N \geq 15$; (4) child/family sample; (5) written in English; (6) peer reviewed. First, titles and abstracts were screened, and relevant articles were reviewed, based on the above general criteria. Next, two independent reviewers rated the quality of each article meeting inclusion criteria.

[1]Serious psychiatric illness was defined throughout the current review paper as the "presence of symptoms of suicidal ideation, homicidal ideation, psychosis, or threat of harm to self or others due to mental illness severe enough to warrant psychiatric hospitalization based on the American Academy of Child and Adolescent Psychiatry (1996) level of care placement criteria for psychiatric illness" (Henggeler et al. 1999b, p. 1332). Additionally, youth with "serious emotional disturbance (SED)" defined as internalizing and/or externalizing problems severe enough to qualify for mental health services in public school who were "currently in or at imminent risk of a costly out-of-home placement" (Rowland et al. 2005, pp. 13–14) were also included in the serious psychiatric illness category.

Each study was evaluated in terms of study design and implementation, using the Quality Index (QI; Downs and Black 1998), which has 27 questions and a possible total quality score of 32. The QI was developed to provide a valid and reliable checklist for assessment of study quality. QI total scores have excellent internal reliability (Kuder-Richardson-20 = .89), test–retest reliability (r = .88), and interrater agreement (r = 0.75, respectively; Downs and Black 1998). We chose this checklist over alternative scales (e.g., Moher et al. 1995) because it allows for assessment of both randomized and non-randomized studies and provides a broad evaluation of study quality details related to quality of reporting, internal validity, power, and external validity. An overall study quality score is also obtained from the QI, with higher scores indicative of a higher-quality study.

Two reviewers were trained to use the QI by reading and discussing the criteria for the QI items (Downs and Black 1998) and conducting a pilot trial that involved discussion of divergent QI ratings. Independent reviewer ratings were then compared, and Kappa statistics were calculated to assess interrater agreement for total scores. The first and second authors rated all studies on quality; and the weighted kappa calculated for the total scores was 0.55, representing fair-to-good agreement (Kappa = between .40 and .75; Fleiss 1981). Next, the two reviewers discussed ratings with low agreement; and a consensus on these ratings was reached. Quality ratings for the 18 included studies ranged from 16 to 23 (mean = 20.7 of 32 possible points). See Table 1 for total quality ratings. The mean QI rating from the current study is higher than those documented in prior reviews, which range from 14 to 17 (Downs and Black 1998; McPherson et al. 2005; Paukert et al. 2011). As such, this suggests an overall good quality of included papers.

Results

A total of 242 articles were identified using the above described search methods. Based on review of titles and abstracts, 143 papers were excluded because of a focus on topics unrelated to the current review. The remaining 99 articles were reviewed for study content. Eighty-one papers were excluded because they did not meet one or more of the six inclusion criteria or focused solely on treatment of externalizing behaviors. Eighteen were chosen for inclusion: two studies focused on MST for treatment of difficulties related to child maltreatment, six studies focused on MST for treatment of serious psychiatric illness[1], and ten studies focused on MST for treatment of health problems (i.e., obesity; treatment adherence for diabetes).

Of note, the authors of the reviewed studies did not always specify directly which outcome measures were of primary and secondary importance. For instance, Rowland et al. (2005) examined MST for youth with serious emotional disturbance and measured changes in caregiver social support, externalizing and internalizing symptoms, minor criminal activity, and out-of-home placements. In another study investigating MST for physically abused youth and their families, Swenson et al. (2010) measured changes in youth mental health symptoms, parent psychiatric distress, natural social support for parents, parenting behaviors associated with maltreatment, youth out-of-home placements, changes in youth placement, and reabuse. For each of these studies, outcomes were not clearly specified to be of primary versus secondary importance. Further, determination of what is a primary versus secondary outcome is likely to differ by disorder type and the individual asked (e.g., therapists and parents might have very different goals for treatment). As such, it was difficult to differentiate primary and secondary outcomes for purposes of this review and, therefore, these designations were not made.

All studies discussed herein were reviewed by the authors to assess for MST treatment adherence. Each study involved adapted MST to provide appropriate types of therapeutic

support for the specific populations being studied. However, all studies reported following MST guidelines, including use of the MST manual, adherence to the nine core MST principles, conducting a weeklong MST training for providers, and MST supervision (e.g., Henggeler et al. 2009). In addition, all studies reported adhering to the MST-based treatment fidelity protocol. Scott Henggeler, the developer of MST, was directly involved in about half of the studies. Only one study (Brunk et al. 1987) was not as clear about adherence to MST standards, but did note that weekly supervision for MST was provided. All important elements were recorded in a summary table, including indication of studies that were reviewed in the two prior reviews (Curtis et al. 2004; Painter 2010) and the current paper (see Table 1).

Has MST Been Shown to be Efficacious or Effective in Decreasing Symptoms and/or Promoting Positive Outcomes for Youth in Studies Conducted on the Non-Externalizing Psychological and Health Problems?

Child Maltreatment

Two studies examined MST in the treatment of difficulties associated with child maltreatment, particularly physical abuse (Brunk et al. 1987; Swenson et al. 2010), psychological injury, and/or neglect (Brunk et al. 1987), with different comparison groups (parent training, Brunk et al. 1987; Enhanced Outpatient Treatment [EOT], Swenson et al. 2010). In the Brunk et al. (1987) study, the parent-training comparison option included teaching groups of approximately seven parents from five families about child development and management strategies. Both the parent-training comparison and the MST groups received eight weekly 1.5-h sessions with graduate student therapists in a university setting (Brunk et al. 1987). In another study with community therapists in a community setting, the Swenson et al. (2010) EOT comparison treatment consisted of tailored services, which could include outpatient, day and/or residential treatment with individual and/or family therapy, parent training, substance-abuse treatment, and/or medication management. Average amount of services provided did not differ significantly between the two groups (EOT = 76 h over average of 4.0 months; MST = 88 h over average of 7.6 months). However, the treatment completion rate was significantly lower for EOT than for MST (83 versus 98 %, $p < .05$; Swenson et al. 2010).

MST was associated with a statistically significant improvement in observed parent–child interactions (sequential measures) compared with the parent-training approach (Brunk et al. 1987). In the first study, MST therapists reported greater decline in family problems than parent-training therapists; and across groups, the decline in family problems was greater among abusive families than among neglectful families (Brunk et al. 1987). Parents in the parent-training group reported a significant decline in social problems, while parents who received MST did not (Brunk et al. 1987). In the other study, MST was associated with statistically greater improvements in natural social supports for parents, parent-reported decrease in psychiatric distress, and reduction in youth-reported post-traumatic stress disorder symptoms compared with that reported by families in EOT (Swenson et al. 2010). Compared with EOT, MST was also associated with statistically greater reductions in caregiver- and youth-reported neglect, youth-reported psychological aggression, youth-reported minor assault, and caregiver- and youth-reported severe assault, as well as youth out-of-home placements and changes in youth placement (Swenson et al. 2010). Across groups, similar reductions were found for youth-reported depressive symptoms, parent-reported global psychiatric distress, and number of positive symptoms, while parent-reported youth social skills increased (Swenson et al. 2010). MST and the respective comparison treatment were both associated with reductions in caregiver-reported severity of identified problems, overall stress, parental psychiatric symptoms (Brunk et al. 1987), and Child Protective Services-reported frequency of reabuse (Swenson et al. 2010).

Serious Psychiatric Illness

Four articles based on a single clinical trial examined MST provided by community therapists in a university setting versus inpatient hospitalization in the treatment of youth with serious psychiatric illness[1]. These youth participants experienced "presence of symptoms of suicidal ideation, homicidal ideation, psychosis, or threat of harm to self or others due to mental illness severe enough to warrant psychiatric hospitalization based on the American Academy of Child and Adolescent Psychiatry (1996) level of care placement criteria for psychiatric illness" (Henggeler et al. 1999, 2003; Huey et al. 2004; Schoenwald et al. 2000). The original study (Henggeler et al. 1999) and a follow-up paper focused on short-term (i.e., four-month post-recruitment) outcomes (Schoenwald et al. 2000). All but one of the MST youth (56/57) completed treatment with an average duration of 123 days (SD = 29 days) and 97.1 h of direct contact hours with their therapist. Among the comparison group of hospitalized youth, 56 of 59 completed the study. Fourteen (25 %) of the youth from the MST group were hospitalized for an average of 2.2 days during the two-week period following recruitment, while youth in the comparison group remained in the hospital for an average of six days during this period, after which they received usual community services (Schoenwald et al. 2000). After additional youth were recruited to this study, two follow-up papers (Henggeler et al. 2003; Huey et al. 2004) examined outcomes at 12- to 16-month post-recruitment. In these later papers, 74 of 79 MST families completed treatment, with an average duration of 127 days (SD = 32 days) and 92 h of clinical service, and all 77 youth in the hospitalization condition remained in the study through the 12- to 16-month post-recruitment follow-up (Henggeler et al. 2003). Throughout the study, (re)hospitalization, out-of-home placements, and/or incarceration occurred for at least half of the youth in each group (Henggeler et al. 2003).

Although MST showed significant benefits over hospitalization in certain areas, the effects were not across all areas; and some were not long-lasting. Compared with inpatient hospitalization, MST was associated at four months with statistically significant improvements in caregiver- and teacher-reported youth externalizing symptoms and family functioning (youth-reported structure and caregiver-reported cohesion), significantly fewer days out of school, significantly higher caregiver satisfaction (Henggeler et al. 1999), and significantly fewer overall days in the hospital (72 % reduction) and in other out-of-home placements (49 % reduction) (Schoenwald et al. 2000). Of note, 57 % of youth from the MST group were hospitalized during the active treatment phase (Schoenwald et al. 2000). However, these differences disappeared by the 12- to 16-month follow-up assessment (Henggeler et al. 2003). Over time, MST youth reported a significantly different trajectory as compared to hospitalized youth (no change), with a steady decrease in family cohesion during treatment followed by an increase (Henggeler et al. 2003). For both MST and inpatient hospitalization conditions, significant reductions were found for caregiver-reported youth internalizing and externalizing symptoms, and caregiver control and supervision by one-year follow-up (Henggeler et al. 2003). Further, inpatient hospitalization was associated with a statistically significant increase in youth-reported self-esteem compared with MST (Henggeler et al. 1999), though this treatment effect was no longer observed at the 12- to 16-month follow-up assessment (Henggeler et al. 2003).

In another article based on the same study, MST was associated with statistically significant reductions in youth-reported attempted suicide at one-year follow-up as compared with hospitalized youth (Huey et al. 2004). MST was also initially associated with an increase in caregiver-reported parental control from pre- to post-treatment compared with constant levels of parental control reported by caregivers of hospitalized youth; however, scores reported by MST caregivers on this measure returned to baseline by one-year follow-up (Huey et al. 2004). Over time, MST and hospitalization were both associated with reductions in caregiver-reported, youth-attempted suicide; youth-reported suicidal ideation;

caregiver-reported anxiety and depression; youth-reported depressive affect; and youth-reported hopelessness (Huey et al. 2004).

In another study following youth with "serious emotional disturbance (SED)," defined as internalizing and/or externalizing problems severe enough to qualify for mental health services in public school who were "currently in or at imminent risk of a costly out-of-home placement," MST was provided by community therapists in a university setting and was compared with usual treatment (Rowland et al. 2005). Usual treatment consisted of services contracted through private agencies and tailored for each individual based on his/her needs, which were determined by the providers, family members, and/or other individuals serving that youth. Possible services included individual and family therapy, medication management, intensive in-home services, therapeutic foster care, day treatment, group-home treatment, hospital-based residential treatment, and therapeutic aide services. Treatment completers included 25 of 26 youth receiving MST and 26 of 29 youth receiving usual treatment, and Rowland et al. (2005) based their study on the first 31 youth who completed the 6-month follow-up (MST: $N = 15$; Usual treatment: $N = 16$). The usual treatment group received an average of four hours per month of clinical services, and these youth also spent 40 % of the treatment period (mean = 11.83 monthly days) in out-of-home placements (Rowland et al. 2005). On the other hand, the MST group completed an average of 12.1 treatment hours per month with their therapists and spent about 13 % of the treatment period (mean of 3.75 monthly days) in out-of-home placements (Rowland et al. 2005). MST was associated with statistically significant reductions in youth-reported externalizing and internalizing symptoms, and youth-reported minor criminal activity as compared with usual treatment; in addition, MST was associated with significantly fewer days in out-of-home placements than usual treatment and a non-significant trend for improved social supports for caregivers (Rowland et al. 2005). No significant treatment effects between groups were found for caregiver-reported youth externalizing and internalizing symptoms, youth-reported substance use, arrests per month (juvenile justice arrest records), family adaptability or cohesion (average of caregiver- and youth-reports), or school placement (records of neighborhood vs. alternative schools).

Health Problems

With regard to health problems, one pilot study (Naar-King et al. 2009) and a subsequent paper using the same sample (Ellis et al. 2010) examined MST for youth obesity relative to a group weight-loss intervention with community therapists in a university setting. The comparison condition involved clinic-based psychoeducational and behavioral activities for the youth and their immediate family in 10 weekly sessions (Shapedown program) with three additional follow-up monthly sessions to match the six-month MST treatment length (Ellis et al. 2010). Nineteen of 24 participants in the MST group, as compared to 22 of 25 in the control group, completed post-treatment data collection (Naar-King et al. 2009). Of note, the control group had no treatment completers and an average of only .84 total sessions, whereas the MST group completed an average of 1.4 sessions each week over six months (Naar-King et al. 2009). Results indicated that MST youth experienced significant reductions in percent overweight, body fat, and body mass index (BMI), whereas these effects were not found for youth in the group weight-loss intervention (Naar-King et al. 2009). In a subsequent paper, the MST youth reported statistically significant improvements in family encouragement, reductions in family discouraging behaviors, and fat and fiber intake; however, only a trend to significant effects was found for family participation in healthy behaviors, with MST youth reporting increases, and youth in the group weight-loss intervention reporting a slight decline in participation (Ellis et al. 2010). At seven-month follow-up, youth who reported increased family participation in exercise experienced

statistically significant reductions in BMI, percent overweight, and body-fat composition (Ellis et al. 2010).

Two papers based on a single pilot study (Ellis et al. 2004, 2005c), and four other papers (Ellis et al. 2008, 2005b, 2007; Naar-King et al. 2007) based on the subsequent larger clinical trial with community therapists in a university setting (Ellis et al. 2005a) examined MST in comparison with a control treatment among youth with poorly controlled Type I diabetes. The control group received standard multidisciplinary medical care (endocrinologist, nurse, dietician, social worker, and psychologist) and met with the medical team once every three months (Ellis et al. 2004). In the pilot study, 12 of 13 control youth and 13 of 16 youth in the MST group completed treatment, with an average of 46 sessions over an average of 6.5 months; further, two youth did not complete six-month data collection and were not included in the study sample (Ellis et al. 2004). In the larger subsequent study, 10 of 63 control youth and seven of 64 MST youth completed treatment, with MST youth completing an average of 48 (treatment completers) or nine (dropouts) sessions over an average of 5.7 months (Ellis et al. 2005a, b). The MST group also received standard medical care (Ellis et al. 2005a).

By post-treatment in the pilot study, MST youth had achieved statistically significant improvements in treatment adherence for blood glucose testing, metabolic control, and decline in number of inpatient admissions, whereas control youth did not (Ellis et al. 2004). In the nine-month follow-up study with the same sample, MST youth experienced a statistically significant decline while control youth experienced an increase in inpatient admissions; on the other hand, no change was found in use of the emergency room for either group (Ellis et al. 2005c). Further, lower admissions were associated with improved metabolic control for MST but not control youth (Ellis et al. 2005c). By post-treatment in the larger clinical trial, MST youth had achieved statistically significant improvements in treatment adherence for blood glucose testing, metabolic control, and decline in number of inpatient admissions (Ellis et al. 2005a) and significant reductions in diabetes-related stress (Ellis et al. 2005b), whereas control youth did not. Further, MST led to a statistically significant reduction in caregiver overestimation of youth responsibility for diabetes care by post-treatment, with continued decline by 12-month post-recruitment follow-up. On the other hand, control caregivers reported statistically significant increases in their overestimation of youth responsibility for diabetes care by post-treatment, though this effect remained stable by 12-month follow-up (Naar-King et al. 2007). At 12-month follow-up, the decline in admissions remained statistically significant for MST youth, though the treatment effect for metabolic control disappeared; in addition, only two-parent families maintained improvements in blood glucose testing (Ellis et al. 2007). At 24-month post-recruitment follow-up, youth in MST had statistically significantly fewer diabetic ketoacidosis (DKA) hospital admissions (47 %) than control youth (Ellis et al. 2008).

In another study, MST was compared to telephone support for youth with poorly controlled diabetes (Ellis et al. 2012). The telephone support control group received weekly calls (average of 14.0 over average of 4.9 months) during which graduate student therapists provided support for diabetes care through nondirective, client-centered counseling (Ellis et al. 2012). Patients in the MST group completed an average of 45.7 sessions over an average of 5.6 months with community therapists in a university setting (Ellis et al. 2012). All participants also received standard multidisciplinary medical care (endocrinologist, nurse, dietician, social worker, and psychologist) and met with the medical team once every three months (Ellis et al. 2012). At post-treatment and six-month follow-up, MST was associated with statistically significant improvements in metabolic control and caregiver-reported youth adherence as compared to the control group. However, no change was found for youth-reported adherence over the course of treatment for either group (Ellis et al. 2012).

In summary, results indicated that MST led to more positive outcomes than comparison treatments for many but not all outcomes in studies of child maltreatment, serious psychiatric illness[1], and health problems (i.e., obesity and treatment adherence for diabetes). Further, in one study on child maltreatment, MST was less efficacious than parent training (an evidence-based comparison treatment) on one outcome, reducing social problems (Brunk et al. 1987).

For Which Specific Populations or Demographics and in Which Settings is MST Efficacious or Effective When Used to Treat These Specific Non-Externalizing Psychological and Health Problems?—In each of these studies, MST was conducted with male and female youth from diverse ethnic backgrounds (i.e., African American, White, Asian American and Pacific Islander, multiracial, other) who were between 10 and 17 years of age. The youth lived with biological/adoptive parents or other relatives in single- or two-parent households, and many families were receiving government aid. For certain periods of time, some youth also lived in out-of-home placements, such as juvenile detention center, inpatient-hospital, residential, or foster or group-home settings. Diagnoses or problems among these youth varied, including internalizing (major depression, bipolar disorder, dysthymia, post-traumatic stress disorder, psychosis), externalizing (attention-deficit hyperactivity disorder and conduct disorder), health problems (diabetes or obesity), and/or experience of child abuse.

Three studies examined the relative effects of MST and a comparison treatment as a function of demographic characteristics (Ellis et al. 2005b; Naar-King et al. 2007; Huey et al. 2004). One study examined differences in self-reported diabetes stress as a function of treatment (MST, standard medical care) and possible moderating effects of age, gender, and ethnicity (Ellis et al. 2005b). Significant reductions in diabetes stress were found among MST as compared to the control condition; further, no significant moderation effects were identified (Ellis et al. 2005b). Another study examined differences in caregiver-reported overestimation of youth responsibility for diabetes care and possible moderating effects of age, race, or single- versus two-parent status (Naar-King et al. 2007). Again, significant reduction in caregiver overestimation was found for the MST but not control group; but no significant moderation effects were found (Naar-King et al. 2007). These findings suggest that the intervention was effective for all individuals in each study.

In another study, Huey et al. (2004) examined differences in caregiver-reported youth suicidal behavior as a function of treatment (MST, inpatient) and possible moderating effects of age, gender, and ethnicity. Differential trends by treatment condition were reported for each of these demographic characteristics (Huey et al. 2004). However, since the authors conducted only one statistical test across time (baseline to one-year follow-up) and not for each time period (i.e., baseline to post; and post to one-year follow-up), it is not possible to draw conclusions about differences between treatment groups.

None of the studies examined the comparative efficacy of MST provided in different treatment settings, such as the family's home and/or other community locations.

Is MST Cost-Effective for Treating These Specific Non-Externalizing Psychological and Health Problems?—Although a number of studies mentioned the intensity and associated cost of MST, only four papers provided further details on MST cost-effectiveness, specifically for treatment of youth experiencing severe psychiatric illness (Henggeler et al. 1999; Sheidow et al. 2004) or difficulties with diabetes treatment adherence (Ellis et al. 2005c, 2008). In one paper based on the clinical trial discussed in Henggeler et al. (1999), short-term cost-effectiveness was demonstrated for MST in treatment of youth referred for hospitalization due to psychiatric emergency (Sheidow et al.

2004). Specifically, MST was associated with $1,617 in average net savings for Medicaid from pre- to post-treatment as compared with usual inpatient care and community aftercare, while costs equalized over the one-year follow-up (Sheidow et al. 2004). With regard to short-term outcomes, MST was also more cost-effective based on each dollar spent for achieving improvement in each clinical outcome, including externalizing behavior, internalizing behavior, and global severity of symptoms; however, at twelve-month follow-up, treatment groups were comparable in long-term clinical outcomes (Sheidow et al. 2004). In another paper, MST led to fewer costly out-of-home placements for youth with serious emotional disturbance compared to usual treatment (Rowland et al. 2005), though details of related savings were not discussed.

With regard to diabetes treatment adherence, MST was significantly more effective than standard medical care at reducing medical charges and direct care costs for youth with poorly controlled type I diabetes (Ellis et al. 2005c). By nine-month follow-up, hospital charges decreased significantly for youth receiving MST, while control youth experienced an increase in charges. In addition, direct hospital costs for youth receiving MST declined significantly (68 %), while costs approximately doubled for youth receiving standard medical care (Ellis et al. 2005c). Finally, another study (Ellis et al. 2008) found that MST cost 6,934 USD per youth, though considerable offsets in cost occurred due to reductions in DKA hospital admissions.

Discussion

In this review, findings were mixed with regard to the relative outcomes of MST versus other treatments among youth experiencing child maltreatment, serious psychiatric illness[1], or health problems (i.e., obesity and treatment adherence for diabetes). MST was a substantially more intense (and potentially more costly) treatment than many of the comparison treatments. Further, all reviewed studies were considered hybrid efficacy-effectiveness trials, with differential focus on efficacy- versus effectiveness-focused features. Overall, while MST was not consistently superior to other evidence-based comparison treatments (e.g., parent training), it was associated with greater immediate benefits for youth relative to treatment as usual. By follow-up, certain significant treatment effects for MST were retained, while others disappeared for each population.

MST for health problems generally led to greater benefits for youth than usual treatment, including weight loss for obesity and improved metabolic control for diabetes; however, certain limitations, including few unique studies and/or limited long-term benefits (e.g., Ellis et al. 2007), preclude strong conclusions and indicate the need for further investigation. In addition, MST significantly improved the majority of outcomes for child maltreatment relative to comparison treatments (e.g., reducing youth mental health symptoms, parenting behaviors associated with maltreatment, and improving parent–child interactions) though the treatments were similar in reducing severity of other identified problems, including frequency of reabuse (Brunk et al. 1987; Swenson et al. 2010). Further, despite showing significant benefits for youth with serious psychiatric illness including reduced internalizing and externalizing behavior (e.g., Henggeler et al. 1999, 2003), participants treated using MST had a high hospitalization rate similar to the control group, suggesting that home-based MST is not sufficient for this population (Henggeler et al. 2003, p. 550). On the other hand, another study found that MST led to significantly fewer out-of-home placements for youth with serious psychiatric illness as compared to control youth (Rowland et al. 2005). This discrepancy between findings may be due in part to the different lengths of follow-up used, with the former study (Henggeler et al. 2003) reporting results from a twelve- to sixteen-month follow-up, whereas the latter study (Rowland et al. 2005) used a six-month follow-up. When there is greater time to follow-up, youth with a history of serious psychiatric

illness[1] may simply require more emergency or out-of-home treatment, regardless of initial treatment condition. Further, power may have been an issue contributing to these discrepant findings due to a small sample size ($N = 31$) in Rowland et al. (2005) as compared to a larger sample ($N = 156$) in Henggeler et al. (2003). Of note, another limitation of the Rowland et al. (2005) study was that it was terminated early due to "implementation difficulties" (p. 20). As research on MST for treatment of child non-externalizing psychological and health problems continues to grow, future studies could conduct meta-analyses to allow for effect size comparisons. Finally, in studies focused on treatment of severe psychiatric illness, MST showed an effect over hospitalization on youth-reported suicide attempts but there were no differences in caregiver-reported youth suicide attempts, youth- or caregiver-reported suicidal ideation, depression, or hopelessness (e.g., Huey et al. 2004).

Further, for the four articles based on the same study comparing MST with inpatient hospitalization (Henggeler et al. 1999; Schoenwald et al. 2000; Henggeler et al. 2003; Huey et al. 2004), the results may be confounded because a large proportion of patients in MST (e.g., over 40 %, Huey et al. 2004) required a hospital admission during the course of treatment. Thus, nearly half of the MST sample received both interventions. Additionally, on certain outcomes, the effects of MST were similar to those in the comparison treatments. Future investigations will need to clarify more explicitly primary versus secondary outcomes for which MST is most beneficial. With such designations, comparisons between MST and other treatments on efficacy and effectiveness can be made more clearly.

In terms of long-term benefits, certain studies found that the effects of MST, similar to those of comparison treatments, did not persist over time (e.g., Ellis et al. 2007; Henggeler et al. 2003). Of note, a decline in MST benefits over the long-term may be expected, particularly for high risk populations in community-based settings due to severity of difficulties and increased risk for recurrence over time (e.g., youth with severe psychiatric illness and histories of hospitalization, or chronic difficulties with diabetes treatment adherence). While it is worthwhile to better understand long-term outcomes, further discussion is beyond the scope of this review. In the future, it will remain important for investigators to examine modifications in treatment content and method of delivery to improve MST outcomes, durability of treatment effects, and generalizability with regard to non-externalizing psychological and health problems examined in this study.

In terms of effectiveness, none of the reviewed studies compared treatment effects of MST across settings (e.g., home vs. community center) or combinations of settings (e.g., outpatient clinic, home, and school settings). Further, only three studies examined outcomes following MST and the comparison group as a function of specific population characteristics or demographics (Ellis et al. 2005b; Naar-King et al. 2007; Huey et al. 2004), and no significant differences were found. This indicates that similar treatment effects were found for all groups, not limited to specific subgroups. However, small sample sizes and data analytic limitations preclude firm conclusions. Future investigations will need to examine more carefully the potential roles of different settings and population variables as predictors of MST outcomes.

In the current review, four studies provided details about the cost-effectiveness of MST for non-externalizing psychological or health problems (Henggeler et al. 1999; Sheidow et al. 2004; Ellis et al. 2005c, 2008). Relative to control conditions, MST was cost-effective for youth with serious psychiatric illness[1] and those with diabetes. No studies reviewed cost-effectiveness for MST in treatment of child maltreatment or obesity. In future investigations, documentation of MST cost-effectiveness will be necessary to promote dissemination of this program for non-externalizing psychological and health problems.

Of note, with regard to implementation, the MST treatment model works to ensure treatment fidelity and adherence by requiring fulfillment of a number of potentially challenging requirements. Therapists must be employees of an established MST program, engage in rigorous and continual training (five-day initial orientation and one-and-a-half-day quarterly booster trainings), and obtain ongoing, weekly clinical supervision/consultation from certified MST clinical supervisor(s) (Multisystemic therapy: An overview 2007). In addition, therapists are expected to be available at all times for their four to six assigned families, which is likely to increase the demands of their job. Such characteristics of MST may make it challenging to study the MST efficacy based on variations of settings and components used because of the need for flexibility in the delivery of MST services (Wolfe and Mash 2006). However, based on the mixed findings in this review, it will be important for investigators to examine whether differential outcomes documented between MST and comparison interventions are a result of treatment intensity or other characteristics (e.g., therapist experience, parent engagement, severity of youth symptoms) of the interventions. Overall, studies should more explicitly focus on comparing MST and other treatments on effectiveness by examining factors including cost and accessibility.

In summary, further research is needed to extend findings from the current review with attention to (1) short- and long-term efficacy and effectiveness of MST in the treatment of various psychological and health problems; (2) the role of demographic, clinical, or delivery variables in predicting outcomes; (3) efficacy of treatment components or types of services provided in MST (e.g., parent training; individual therapy); and (4) cost-effectiveness of MST for non-externalizing psychological and health problems. Further, investigators should continue to pursue treatment studies that investigate implementation feasibility of MST. Such studies are important because, although MST may not always be the first line of treatment for child maltreatment, suicidality, health, or other non-externalizing problems, it may be greatly beneficial for promoting treatment success or prevention of relapse in more complex or severe cases.

One major limitation of the current review was the relatively small number of unique studies that met inclusion criteria. Additional RCTs or quasi-experimental investigations are needed to replicate or confirm findings or further evaluate MST efficacy and effectiveness for various non-externalizing psychological or health problems. Second, despite the adequate study quality, some were limited by the use of inappropriate statistical analyses and lack of sufficient power for detecting a clinically important effect. Future MST research should use more appropriate statistical analyses and recruit larger samples to augment power. Of note, the above-discussed limitations and recommendations apply to many intervention trials, among them also MST trials.

Conclusions

This review provides mixed support for MST in treatment of non-externalizing psychological and health problems among various populations. As such, it will be important to continue expanding our understanding about the utility of MST and its components to better understand and advance its potential as an intervention or prevention program for non-externalizing psychological or health problems. With a strong foundation on the ecological systems theory of child development, MST provides a treatment framework that may allow clinicians to better conceptualize and target problems within systems that are contributing to a child's symptoms, regardless of problem type. By intervening at the systems level, MST may then function as both an intervention and a prevention program, promoting longstanding treatment effects for youth and their families through its ultimate goal to encourage more adaptive, generalizable patterns of behavior and interaction among the youth and other important individuals.

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Table 1

Summary of reviewed studies—quality, method, and results

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
Child maltreatment							
Brunk et al. (1987)[b]	20	Maltreating families — physical or psychological trauma; neglect Mean age = 11.2 55 % male 57 % White 43 % African American	MST individually at home or clinic Parent training with groups at clinic	N = 43 MST = 8 abusive, 8 neglectful families Parent training/ control = 10 abusive, 7 neglectful families	The Symptom Checklist-90 (parent self-report) Behavior Problem Checklist (parent- report on youth) 90-item Family Environment Scale (parent) 71-item Family Inventory of Life Events and Changes (parent) Treatment Outcome Questionnaire developed by authors (parent) Observation and systematic coding of parent–child interactional system	Pre–post RCT Graduate student therapists University setting	MST more effective in improving parent–child interactions Parent training more effective in reducing social problems Both treatments led to decreased parental psychiatric symptomology, reduced overall stress, and a reduction in the severity of identified problems
Swenson et al. (2010)[a,b]	23	Physically abused youth and their families Ages 10–17 Mean age = 13.88 55.8 % female 68.6 % African American 22.1 % White 9.3 % Other	MST at homes and community settings (e.g., school) Enhanced Outpatient Treatment at public-sector mental health center	N = 86 MST = 44 abusive families EOT = 42 abusive families	113 items Child Behavior Checklist (parent-report on youth behavioral functioning) 54 items Trauma Symptom Checklist for Children (youth) Social Skills Rating System (parent- report on youth) Brief Symptom Inventory (parent-report of distress) Conflict Tactics Scale (parent and youth report of parent behavior) 40 items Interpersonal Support Evaluation List (parent-report of support) Reports of reabuse in family via review of Child Protective Services files Parent-report monthly of youth participation in other treatment	Baseline and 2, 4, 10, and 16-month post-baseline RCT Community therapists Community setting	MST significantly more effective than EOT in reducing: (1) youth mental health symptoms (2) parent psychiatric distress (3) parenting behaviors associated with maltreatment (4) youth out-of-home placements, (5) changes in youth placement MST significantly more effective than EOT in improving natural social supports for parents At 16-month follow-up, lower reabuse among youth in MST than among those in EOT, though not a significant difference
Obesity							
Naar-King et al. (2009)[a,b]	18	Obese youth and their caregiver(s) Age 12–17 years Mean age = 14.5 77.1 % female	MST at home and other community settings	N = 48 MST = 24 Shapedown/ control = 25	BMI Percent overweight Percent body fat	Pre–post Pilot RCT Community therapists University setting	MST associated with reduced percent overweight, body fat, and BMI, whereas Shapedown was not

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
		100 % African American	Shapedown at clinic with child and caregiver				
Ellis et al. (2010)—based on Naar-King et al. (2009)[a,b]	22	Obese youth and their caregiver(s) Ages 12–17.11 years 77 % female 100 % African American 55 % Single parent	MST at home and other community settings Shapedown at clinic with child and caregiver	N = 49 MST = 24 Shapedown/ control = 25	Social Support for Eating Habits and Exercise Scale (youth) Fat and Fiber-Related Diet Behavior Questionnaire (youth) BMI	Pre–post 7-month follow- up Pilot RCT Community therapists University setting	MST more effective than Shapedown in improving family encouragement for healthy eating and family participation in exercise and decreasing discouraging behavior from family members At 7-month follow-up, increases in family participation in exercise were significantly related to positive outcomes, including lower youth BMI, % overweight, and body-fat composition
Diabetes							
Ellis et al. (2004)[a,b]	16	Youth with poorly controlled Type I diabetes Mean age = 13.6 56 % male 61 % African American 30 % White 9 % Other 30 % Single parent Mean family income = $31 K 100 % Type 1 diabetes	MST at home and other community settings Standard medical care at the hospital	N = 31 completers MST = 16 Standard care (control) = 15	Average blood glucose over past 2–3- months calculated to assess metabolic control 0–100 % scale Diabetes Management Scale (youth) Twenty-Four Hour Recall Interview to assess youth-reported adherence behaviors (semi-structured, clinician- administered) Hospital utilization data from computerized hospital medical information system Treatment satisfaction questionnaire devised for study (parent)	Pre–post Pilot RCT Community therapists University setting	MST associated with (1) improved adherence for blood glucose testing and metabolic control from pre- to 6-month post-test and (2) decreased number of inpatient admissions by 6-month post-test Greater metabolic control associated with higher parent-reported youth adherence No significant changes found for control youth in blood glucose testing, metabolic control, or inpatient admissions
Ellis et al. (2005c)—based on Ellis et al. (2004)[a,b]	22	Youth with poorly controlled Type I diabetes Mean youth age = 14.19 Mean parent age = 37.81 Family income = $26, 437 44 % male 75 % African American 19 % White 6 % Other	See Ellis et al. (2004)	See Ellis et al. (2004)	Hospital utilization data from computerized hospital medical information system Costs of medical utilization obtained from hospital financial database	9-month post-recruitment follow-up RCT Community therapists	MST significantly more effective than standard medical care at reducing medical charges and direct care costs. MST youth had decreasing number of inpatient admissions over treatment period while control youth had increasing admissions Lower admissions associated with improved metabolic control for MST youth but not control youth

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
		44 % Single parent			Blood glucose level measured to assess metabolic control	University setting	No change in use of emergency room
Ellis et al. (2005a)[a,b]	22	Youth with poorly controlled Type I diabetes Mean age = 13.2 49 % male 63 % African American 26 % White 11 % Other 51 % Single parent	MST in home and community settings Standard medical care at the hospital	N = 127 completers MST = 64 Standard care (control) = 63	Twenty-Four Hour Recall Interview to assess youth-reported adherence behaviors (semi- structured, clinician-administered) Frequency of blood glucose testing (adherence behavior) obtained from blood glucose meter Blood glucose level measured to assess metabolic control Hospital utilization data from computerized hospital medical information system	Pre–post RCT Community therapists University setting	MST significantly more effective than standard medical care at improving frequency of blood glucose testing and metabolic control MST significantly more effective than standard medical care at decreasing number of inpatient admissions (control youth experienced an increase)
Ellis et al. (2005b)— based on Ellis et al. (2005a)[a,b]	22	See Ellis et al. (2005a)	See Ellis et al. (2005a)	See Ellis et al. (2005a)	54-item Diabetes Stress Questionnaire (youth) Frequency of blood glucose testing (adherence behavior) obtained from blood glucose meter Blood glucose level measured to assess metabolic control	Pre–post RCT Community therapists University setting	MST significantly more effective than standard medical care at reducing diabetes-related stress No significant moderation effects for age, gender, or ethnicity MST appeared to improve metabolic control indirectly through increased regimen adherence, rather than reduced diabetes stress
Ellis et al. (2007)— based on Ellis et al. (2005a)[a,b]	22	See Ellis et al. (2005a)	See Ellis et al. (2005a)	See Ellis et al. (2005a)	Average blood glucose over past 2–3 months measured to assess metabolic control Frequency of blood glucose testing (adherence behavior) obtained from blood glucose meter Hospital utilization data from computerized hospital medical information system	Pre–post, 12-month post-recruitment follow-up RCT Community therapists University setting	MST's significantly greater reduction in blood glucose level compared to standard medical treatment at post-treatment but was not maintained at 12-month follow-up Only two-parent MST families maintained post-treatment improvements in blood glucose testing at 12-month follow-up MST's significantly greater reduction in admissions rate compared to standard medical treatment at post-treatment was maintained at 12-month follow-up Age, race, gender did not moderate changes in blood glucose testing

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
Naar-King et al. (2007)— based on Ellis et al. (2005a)[a,b]	21	See Ellis et al. (2005a)	See Ellis et al. (2005a)	See Ellis et al. (2005a)	20-item Diabetes Family Responsibility Questionnaire (youth and caregiver) Average blood glucose over past 2–3 months measured to assess metabolic control	Pre–post, 12-month post-recruitment follow-up RCT Community therapists University setting	Across groups, African American families reported significantly greater caregiver overestimation of youth responsibility than other families MST associated with significant reduction in caregiver overestimation of youth responsibility for diabetes care by post-treatment, with continued decline by 12-month follow-up Control caregivers reported significant increase in their overestimation of youth responsibility for diabetes care by end of treatment, though effect remained stable by 12-month follow-up No moderation of effects by age, race, or single versus two-parent status
Ellis et al. (2008)— based on Ellis et al. (2005a)[a,b]	19	See Ellis et al. (2005a)	See Ellis et al. (2005a)	See Ellis et al. (2005a)	Hospital utilization data from computerized hospital medical information system Diagnosis of diabetic ketoacidosis (DKA) made by measuring blood glucose, serum acetone, acidosis, ketonuria, and glucosuria Costs of medical utilization obtained from hospital financial database	Pre–post, 6-, 12-, 18-, and 24-month post-recruitment follow-up RCT Community therapists University setting	MST youth associated with significantly fewer DKA hospital admissions (47 %) than control youth MST youth had significantly fewer DKA admissions as compared to their baseline rate at 6-, 12-, 18-, and 24-month follow-up MST cost per youth was 6,934 USD, though offsets in cost occurred due to DKA admission reductions
Ellis et al. (2012)[a,b]	23	Youth with poorly controlled Types I or 2 diabetes Mean age = 14.2 64 % male 77 % African American 20 % Whites 3 % Other 41 % two parents 59 % single parent Average duration of diabetes = 4.7 years	MST in home and community settings Telephone support (TS)—weekly phone calls focused on	N = 146 MST = 74	Blood glucose level measured to assess metabolic control 0–100 % scale	Pre–post, 6-month follow-up RCT Community therapists	MST associated with significantly improved metabolic control at treatment termination and 6-month follow-up compared to controls Caregivers of MST youth reported significantly greater youth adherence compared to caregivers of control youth

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
		90 % Type 1 diabetes	support for diabetes care	TS = 72	Diabetes Management Scale (caregiver- and youth-report)	University setting	No change in youth-reported adherence
Serious psychiatric illness							
Henggeler et al. (1999)	22	Youth approved for emergency psychiatric hospitalization because of suicidal ideation/planning or attempted suicide Mean age = 13.0 65 % male 64 % African American 34 % European American 1 % Asian American 1 % Hispanic 22 % two-parent 58 % single parent 20 % with someone other than biological or adoptive parent 72 % receiving government aid 79 % receiving Medicaid 32 % admitted for suicidal ideation, plan, attempt 15 % admitted for homicidal ideation, plan, attempt 11 % psychosis 42 % threat of harm to self or others	MST in homes and community settings Psychiatric hospitalization (44 % of MST youth admitted during treatment due to emergencies beyond community treatment) and usual services in community	N = 113 MST = 57 Psychiatric hospitalization and usual services = 56	Global Severity Index of Brief Symptom Inventory (youth and caregiver) 113-item Child Behavior Checklist (CBCL-parent; TRF-teacher, YSR- youth) Self-Esteem and Antisocial Friends and Conventional Involvement of Friends subscales of Family, Friends, and Self Scale (youth) Personal Experience Inventory (youth) Arrest records Family Adaptability and Cohesion Evaluation Scales-3rd edition (youth and caregiver) Service Utilization Survey Lubrecht's Family Satisfaction Survey (youth and caregiver)	T1-Baseline, T2-after control youth released from hospital, T3-completion of MST RCT Community therapists University setting	MST significantly more effective than emergency hospitalization in reducing youth externalizing symptoms (caregiver- and teacher-report) and improving school attendance. Both groups reported similar decline in emotional distress (youth-report) internalizing symptoms (caregiver- and teacher-report) MST significantly more effective than emergency hospitalization in improving family functioning (MST youth reported greater structure while hospitalized youth reported reduced structure; MST caregivers reported greater cohesion while hospitalized youth caregivers reported less) MST related to significantly higher consumer satisfaction scores (youth and caregiver) than hospitalization Hospitalization significantly more effective than MST at improving youth self-esteem
Schoenwald et al. (2000)—based on Henggeler et al. (1999)[a]	19	See Henggeler et al. (1999)	See Henggeler et al. (1999)	See Henggeler et al. (1999)	Service Utilization Survey Restrictiveness of Living EnvironmentsScale Hospital utilization data from hospital records	Pre to 2-week period post- referral (crisis stabilization), 4-month post- recruitment follow-up RCT Community therapists University setting	MST was associated with 90 % decrease in days hospitalized from T1 to T2 compared to all 100 % of control youth being hospitalized MST prevented hospitalization entirely for 57 % of youth Groups did not differ significantly in days hospitalized between the T2 to T3, though MST

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
							youth had 40 % decline in days hospitalized MST was associated with significantly fewer overall days hospitalized (72 % reduction) and days in other out-of-home placements (49 % reduction) from T1 to T3 as compared to control group
Henggeler et al. (2003)— based on Henggeler et al. (1999)[b]	19	Youth approved for emergency psychiatric hospitalization because of suicidal ideation/planning or attempted suicide Mean age = 12.9 65 % male 65 % African American 33 % European American 1 % Other 31 % two-parent 51 % single parent 18 % with someone other than biological or adoptive parent 69 % receiving government aid 79 % receiving Medicaid 38 % admitted for suicidal ideation, plan, attempt 17 % admitted for homicidal ideation, plan, attempt 8 % psychosis 37 % threat of harm to self or others	MST in homes and community settings Psychiatric Hospitalization (44 % of MST youth admitted during treatment due to emergencies beyond community treatment) and usual services in community	N = 156 MST = 79 Psychiatric hospitalization and usual services = 77 *Continued recruitment following* Henggeler et al. (1999)	Global Severity Index of Brief Symptom Inventory (youth and caregiver) 113-item Child Behavior Checklist (CBCL-parent; TRF-teacher) Self-Esteem subscale of Family, Friends, and Self Scale (youth) Corroboration of school attendance via contacts 20-item Family Adaptability and Cohesion Evaluation Scales-3rd edition (youth and caregiver) Service Utilization Survey Records from state agencies-days spent in out-of-home placements	T1-Baseline, T2- after control youth released from hospital, T3-completion of MST T4-6-month follow-up T5-1-year follow-up RCT Community therapists University setting	MST initially (at post-treatment) more effective than hospitalization at reducing youth externalizing symptoms (caregiver- and teacher-report) and out-of-home placements and increasing school attendance and caregiver-reported family structure and cohesion—differences disappeared by 12 to 16-month post-recruitment **MST youth reported significantly different trajectory for family cohesion as compared to hospitalized youth** (no change), with a steady decrease during treatment followed by an increase Caregivers in both MST and hospitalization groups reported significant improvements in youth internalizing symptoms, and caregiver control and supervision by 1-year follow-up Hospitalization led to quick, short-lived decrease in externalizing symptoms No differences in self-esteem at 1-year follow-up
Huey et al. (2004)— based on Henggeler et al. (1999)[b]	18	See Henggeler et al. (2003)	See Henggeler et al. (2003)	N = 156 MST = 79 Hospitalization = 77	60-item Family, Friends, and Self Scale (youth and caregiver) 5-item Brief Symptom Inventory (youth- report without 6th item related to suicidal ideation)	Baseline, 4-month, and 1-year follow-up RCT Community therapists University setting	Both MST and hospitalization associated with significant decrease in symptoms over time: (1) caregiver- and youth-rated attempted suicide, (2) youth-rated suicidal ideations

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
					14-item anxiety-depression subscale of Child Behavior Checklist (CBCL-parent) 17-item Hopelessness Scale for Children (youth) 53-item Youth Risk Behavior Survey (youth)		(3) caregiver-rated anxious/ depressed (4) youth-rated depressive affect (5) youth-rated hopelessness MST significantly more effective than hospitalization in reducing attempted suicide over 16 months after recruitment MST associated with increase in parental control from pre- to post-treatment (though returned to baseline by 1-year follow-up) Suicidal behavior in hospitalized youth varied as function of age, gender, ethnicity
Sheidow et al. (2004)—based on Henggeler et al. (1999)[a,b]	22	Youth approved for emergency psychiatric hospitalization because of suicidal ideation/planning or attempted suicide 84 % receiving welfare 100 % receiving Medicaid Median monthly family income from employment = $300 For other demographics, see Henggeler et al. (2003)	See Henggeler et al. (2003)	N = 115 *Time 1–3:* MST = 51 Control = 54 *Time 3–5:* MST = 53 Control = 49 Subsample from Henggeler et al. (2003) who were receiving Medicaid (pairs of youthyoked between groups basedon assessment timing)	Global Severity Index of Brief Symptom Inventory (youth and caregiver) 113-item Child Behavior Checklist (CBCL-parent; TRF-teacher) MST costs assessed via Medicaid billing records and grant budgets	T1: Pre T2: point when comparison youth released from hospital T3: 4-month follow-up T4: 6-months after T3 T5: 12-months after T3 RCT Community therapists University setting	MST associated with greater cost benefits than emergency hospitalization at 4 months, but equivalent costs at 16 months
Rowland et al. (2005)[b]	22	Youth with serious emotional disturbance at risk of out-of-home placement Mean age = 14.5 58 % male 84 % multiracial 10 % White 7 % Asian American and Pacific Islander 19 % living with biological/adoptive parent	MST in homes and community settings Usual treatment at home and other settings (e.g., hospital, group home)	N = 31 MST = 15 UT = 16	113-item Child Behavior Checklist (CBCL-parent, YSR-youth) 8 items related to violence Youth Risk Behavior Survey (youth) 12-item Personal Experience Inventory (youth) 40-item Self-Report Delinquency Scale (youth) Archival records-school attendance and restrictiveness of school placements	Pre-, post- RCT Community therapists Community setting	MST significantly more effective than usual treatment in reducing youth-reported externalizing and internalizing symptoms, and minor criminal activity MST significantly more effective than usual treatment in reducing out-of-home placements Non-significant trend found for MST (as compared to usual treatment) in

Areas/studies	Total quality	Population	Setting	Sample size	Measurement tools	Study type	Results
		71 % living with other relatives 39 % Conduct Disorder 32 % Bipolar Disorder 23 % ADHD 16 % Dysthymia 13 % Major Depression 10 % PTSD			20-item Family Adaptability and Cohesion Evaluation Scales-3rd edition (youth and caregiver) Social Support Questionnaire (caregiver) Arrest records and records from state agencies-days spent in out-of-home placements		improving social supports for parents No differences between groups on caregiver-report of youth externalizing and internalizing symptoms, family adaptability or cohesion (averaged youth- and caregiver-reports), youth-reported substance use, arrests per month, or school placement

MST multisystemic therapy, *RCT* randomized controlled trial, *BMI* body mass index, *ADHD* attention-deficit hyperactivity disorder, *PTSD* post-traumatic stress disorder

[a] Studies reviewed in this study that were not included in the Painter (2010) review;

[b] studies reviewed in this study that were not included in the Cohen et al. (2004) review