



Community-Based Treatment of Families with Adolescents with an Autism Spectrum Disorder (Level 1): Two Single Case Experimental Design Studies on the Effects of Multisystemic Therapy

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Accepted: 11 May 2025
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Abstract

Background Families of adolescents with severe behavior problems and an Autism Spectrum Disorder (ASD) level 1 may experience a variety of problems in their functioning. Research suggests that these problems across multiple life areas are best treated with intensive, flexible, and home-based treatment such as Multisystemic Therapy (MST). However, little is known about the treatment results of MST for families of autistic adolescents. **OBJECTIVE:** In two Single Case Experimental Design (SCED) studies ($N=14$ families), the treatment outcomes and effects of MST were assessed.

Methods An observational AB study design was employed. Families receiving treatment as part of two cohorts were asked to participate in the two studies.

Results Overall, some positive changes were observed during MST treatment. Of 22 parents, 8 parents showed significant improvement based on the Reliable Change Index. Tau-U analyses used in both studies reveal that there was little evidence of treatment effect, despite families reporting positive experiences with treatment during interviews. A meta-analysis of Tau-U scores revealed no overall effect for the total study population and a small effect for mothers.

Conclusions Little treatment effect was observed in these SCED studies. *When* changes or effects were observed following MST treatment, these tended to be positive. To reach firmer conclusions, a larger and more robust study would be needed. More research is also needed to attain a better understanding of how to best support families of young autistic people.

Keywords Multisystemic Therapy · Adolescents · Autism spectrum disorder · Behavioral problems · Single Case Experimental Design · Personalized treatment outcomes

Adolescents with an Autism Spectrum Disorder (ASD) have persistent deficits in three areas of social communication and interaction and restricted patterns of behavior interests or activities (American Psychiatric Association [APA], 2013). Examples of deficits experi-

enced by autistic adolescents¹ include a lack of nonverbal communication and difficulties in initiating or maintaining relationships (APA, 2013) or in filtering sensory information (Pattni et al., 2022). The deficits experienced by autistic adolescents are also referred to as cognitive, interpersonal, and adaptive deficits (Pattni et al., 2022; Wagner et al., 2014). Three levels of severity of ASD, based on social communication impairments and restricted, repetitive, behavioral patterns, are distinguished (APA, 2013): level 1 reflects a need for support, while levels 2 and 3 reflect more substantial impairments and needs for support (APA, 2013). Recent research shows that 1 in 54 children meets the diagnostic criteria for ASD (Maenner et al., 2020).

Given the difficulties young autistic people experience, it is expected that these difficulties occur across multiple life domains. While some autistic young people show high levels of academic functioning (Grove et al., 2019), school problems and truancy due to restlessness, sensory difficulties, bullying, and resulting fears and worries (Van der Ree, 2018) are common. The friendships of autistic young people are also shorter and of lower quality than those of neurotypical young people (Pattni et al., 2022). These friendships are more strongly related to elements of the family system (i.e., family functioning and caregiver relationship variables) than to characteristics of individual adolescents (Brown et al., 2023).

At the parental level, a meta-analysis suggests that parents of autistic children report higher levels of parenting stress than parents of neurotypical children (Hayes & Watson, 2013). This may relate to autistic young people often displaying aggressive and other disruptive behaviors; it is estimated that over 50% of autistic young people display aggressive behaviors towards others (Brown et al., 2021). The aggressive behaviors of autistic young people can escalate and lead to removal from mainstream education, out-of-home and residential placement (Sariaslan et al., 2022; Van der Ree, 2018). Consequently, these behaviors may interfere with adolescents' abilities to attain important milestones such as living independently or attaining employment (Brown et al., 2021).

Research shows that disruptive and aggressive behaviors are among the most common co-occurring problems in autistic adolescents and suggests that these behaviors are related to multiple contextual difficulties, consistent with a social-ecological model of adolescent behavior problems (Brown et al., 2021). Families experiencing multiple problems may be best treated with systemic, flexible, intensive interventions that aim to prevent out-of-home placement and enhance family functioning (Tausendfreund et al., 2016). These treatment models can also help address disruptive behavioral problems of autistic adolescents.

Multisystemic Therapy

Multisystemic Therapy (MST) is based on Bronfenbrenner's (1979) social-ecological model and is a home- and community-based treatment model that is known to reduce out-of-home placement and recidivism of adolescents with severe behavior problems (Henggeler et al., 2009). In MST, problem behaviors are viewed as driven by the interplay of risk and protective factors in the systems surrounding the adolescent (i.e., family, friends, school, and neighborhood). As such, MST aims to achieve a reduction in externalizing problem behav-

¹ The authors have tried to avoid ableist language as much as possible by referring to autistic (young) people with identity-first language instead of person-first language as advised by Bottema-Beugel and colleagues (2021).

iors of adolescents (such as aggression), through working with their care givers. Increased parental empowerment, development of parenting skills, and a reduction of parenting stress are main components of MST (Blanckstein et al., 2019). Ultimately, therapists aim to create a supportive context that encourages adolescent and parental adaptive behavior by strengthening support systems for the family (Henggeler & Schaeffer, 2016).

Presently, adolescents aged 10–19 years with severe behavior problems and their families can be treated with MST in the Netherlands (MST-Netherlands/Belgium, 2023) if and when they meet the inclusion criteria (Henggeler et al., 2009). Severe behavior problems in at least two life areas of the adolescent must be the primary reason for referral. Adolescents with a severe intellectual disability (Intelligence Quotient < 50) or ASD (level 2–3 according to the DSM-V criteria; APA, 2013) that are the primary reason for referral or that require specialized treatment are excluded from MST. Also, adolescents with severe problematic sexual behaviors, acute suicidal/psychotic/homicidal behaviors, or internalizing psychiatric problems requiring specialized treatment are excluded (Henggeler et al., 2009).

MST and ASD

MST is presently routinely applied to families of adolescents with severe behavioral problems and an ASD (level 1; Pattni et al., 2022). However, a version of MST tailored to the needs and skills of autistic adolescents² is currently being developed (Wagner et al., 2014). Although a recent randomized clinical trial (RCT) has shown positive results for a small number of families ($n=15$; Wagner et al., 2019), the treatment is not disseminated internationally.

Little is known about the effects of MST in subsamples of families with autistic adolescents. In line with recommendations by the Dutch Knowledge Centre for Child and Adolescent Psychiatry (DKC-CAP; 2023) and recent research insights (Pattni et al., 2022), Van den Hoven and colleagues (2014) suggested MST treatment for autistic adolescents should first focus on psychoeducation around ASD. In recent years, two master's theses (Delisse, 2020; Schepers, 2020) studies have looked into outcomes of families of autistic adolescents receiving MST. In these studies, no significant differences were found between outcomes of matched samples of families of adolescents with ($n=31$) and without ASD ($n=31$) receiving MST, based on routinely collected outcome data. Recent peer-reviewed research notes that promising treatments such as MST could be modified for families of autistic adolescents to provide effective treatment for neurodiverse adolescents with problem behavior (e.g., Schnitzer et al., 2020).

Purpose of the Present Study

Knowledge platforms and research note that the empirical evidence for the effectiveness of most available treatments for autistic adolescents with comorbid difficulties is either weak or lacking (DKC-CAP, 2023; Sutherland et al., 2023; Will et al., 2018). Given that autistic

² When referring to MST for adolescents with ASD, we specifically refer to level 1 ASD according to the DSM-V criteria (APA, 2013) as only this level currently meets the inclusion criteria of MST (Henggeler et al., 2009).

adolescents with severe behavioral problems, such as aggressive behaviors, are unlikely to “age out” of these problems and that these aggressive behaviors may impede with their ability to live independently or attain employment (Brown et al., 2021), realizing effective treatment for autistic adolescents with severe behavior problems is essential. Given this need, the current study aims to assess the effects of MST for autistic adolescents and their families.

Although MST is currently routinely delivered to adolescents with a known or suspected ASD, little is known about treatment effects for this target group. Therefore, the current study set out to assess treatment effects in two small cohorts of families using Single Case Experimental Designs (SCEDs). SCED can be employed to assess effects in a select group of respondents (Delsing & Van Yperen, 2017). To achieve this, each respondent is monitored across time using repeated measurements. This allows for assessment of the effects that result from an intervention per individual (Ponsioen & Hoekman, 2021). In the current manuscript, we report on two SCED studies (Study 1 and 2) that address the following research question: What are the changes on treatment outcomes and treatment effects of MST in families with adolescents with ASD? To answer this question, we (1) evaluated changes in four primary outcomes (adolescents’ internalizing problems, externalizing problems, and ASD-related behaviors and parents’ parenting problems) which were measured at the start and end of treatment, (2) evaluated changes over time during treatment in families’ personalized treatment outcomes (secondary outcomes), (3) compared changes in the secondary outcomes during the intake phase with changes during the treatment phase to evaluate treatment effects, (4) conducted a meta-analysis on these treatment effects, and (5) used interview data as a means to contextualize and interpret the data. Lessons learnt from the first study cohort (Study 1) were used to improve the procedure of the second study cohort (Study 2).

Method

Participants and Procedure

Study 1 was conducted between April 2020 and March 2021. As part of this study cohort, six families of autistic adolescents received MST treatment at one mental health organization in the Netherlands. Average treatment duration is 3–5 months and treatment is monitored by the MST quality assurance system. Therapists deliver treatment to families in their home environment. The intensive treatment consists of a maximum of three 1-hour (systemic) sessions per week. Interventions that are delivered as part of treatment are tailored to the (developmental) needs of family members involved in treatment (Henggeler et al., 2009). All six families that participated in Study 1 were treated by one of two MST therapists. These therapists belonged to one MST team and were supervised by their MST supervisor. Both therapists had received the required 5-day MST training (Henggeler et al., 2009). One of the therapists was employed by an organization that specializes in providing care for persons with ASD. This therapist was specifically hired and trained as an MST therapist for the purpose of delivering treatment to the first cohort.

In June 2021, Study 1 was succeeded by Study 2, which ran until August 2022. As part of this second cohort, eight families of autistic adolescents received MST treatment. In Study

2, four MST therapists from two MST teams delivered treatment. They were supervised by two MST supervisors. Again, all therapists had received the required 5-day MST training (Henggeler et al., 2009). More MST therapists and supervisors were involved in this second pilot study, owing to the insights gained from the initial pilot study. These insights highlighted the necessity to disseminate knowledge more extensively and to accumulate experience among a larger group of therapists. These therapists treated both families with and without ASD related problems. One therapist and one supervisor involved in delivering treatment to cohort 1 assisted in knowledge dissemination to other clinicians involved in cohort 2.

In Study 1, of the six adolescents referred to MST, 50% was female. The mean age of the adolescents was 14.8 years at the start of treatment (range 13.0–17.0 years). All adolescents and primary caregivers were born in the Netherlands, 50% of the adolescents were living in a single-parent household at the start of treatment, and 50% were living in a multiple-parent household. Referrals to MST treatment varied across families; 33% of the families were referred through mental health care services, 33% through youth care services, 17% through child protection services, and 17% through social work. All parents and adolescents that participated in MST and qualified for the study (based on the presence of ASD level 1 in the child) were asked for their consent to participate in the study. From the six families included in the study, nine parents (six mothers and three fathers) and three adolescents (all female) gave their written informed consent for participation in this study and completed sufficient measures to be included in the study. In Study 2, 38% of the eight referred adolescents were female. Their mean age was 15.0 years at the start of treatment (range 12.0–17.0 years). All of the adolescents and their primary caregivers were born in the Netherlands. Of the adolescents, 75% were living in a multiple-parent household and 25% in a single-parent household. Referrals to MST treatment were all made by youth care providers (100%). Of the eight families, thirteen parents (eight mothers and five fathers) provided written informed consent and completed sufficient measures to be included in the study. Two adolescents and one father did give consent, but completed an insufficient number of questionnaires to be included in the study (i.e., each of these respondents completed only one measure). Across the two studies, all families who qualified for the study were approached and agreed to participate. However, some individual family members did opt out. 6 adolescents and 1 father did not give consent for participation. All of these respondents were male; most were respondents in Study 2 and were treated by one of the therapists also involved in Study 1. This implies that during Study 2, the therapist and research team managed to engage families and specifically adolescents in the research study less well than during Study 1. The conducted studies complied with the APA ethical principles, were carried out in accordance with the Declaration of Helsinki, and were approved by the Internal Review Board of a Dutch health care organization (reference number 20.003).

Data collection was organized digitally through the EthicaData application (Avicenna, 2023). Participants downloaded the Ethica application onto their smartphones after giving consent. Through this app, respondents digitally completed general and specific measures. The questionnaire pertaining to the primary outcomes of the study was completed during the intake phase—after family members had downloaded the application—at the start of MST treatment and at the end of MST treatment. The measures pertaining to the secondary outcomes were completed weekly and also ran from shortly after the intake until the end of MST treatment. Families received a gift voucher as an incentive for their participation in

this study (worth €50 maximum, depending on the number of measurements completed). At the start and end of treatment, MST therapists completed a questionnaire containing questions relating to background characteristics of families and societal indicators of success. Procedures in Study 2 were similar to those in Study 1. However, in Study 2, the secondary outcome measurements were carried out twice per week instead of weekly. This was done because one of the lessons learnt from Study 1 was that it was very challenging to obtain sufficient measurements in the intake (A) phase to be able to perform Tau-U analyses for all respondents. By increasing the frequency of these measurements and decreasing the number of secondary outcome measures (to a maximum of three outcomes), we aimed to balance the burden of more frequent but fewer measures. Logbooks kept by therapists indicated in which week the treatment interventions were started. Measurements conducted before this date were included as Phase A measures, given that actual treatment had not yet commenced.

Design

The two observational SCED studies described in this paper both employed AB designs. The use of an AB design allows for the assessment of treatment effects by comparing the scores in the A phase (intake) with the scores in the B phase (treatment). Thus, the intake phase (A) represents the control condition for the treatment phase (B; Parker et al., 2011).

Measures

Primary Outcomes

Adolescent Behaviors. Parents and adolescents reported on behavior problems of adolescents. Both parental and adolescent questionnaires included validated subscales relating to internalizing and externalizing problems of adolescents. For parents, the validated subscales Adolescent Internalizing Problems and Adolescent Externalizing Problems of the *Brief Problem Monitor– Parents* (BPM-P; Achenbach et al., 2011; Rodenacker et al., 2015) were administered. The former consists of 6 items, while the latter consists of 7 items, all rated on a scale from 0 “Never” to 2 “Often.” Respective examples of questions asked as part of these subscales are, “Feels worthless or inferior”; “Argues a lot.”

For adolescents, behavior problems were assessed using the 6 items from the Adolescent Internalizing Problems and 7 items from the Adolescent Externalizing Problems subscales of the *Brief Problem Monitor– Youth* (BPM-Y; Achenbach et al., 2011; Rodenacker et al., 2015). Respective examples of questions asked as part of these subscales are, “Feels worthless or inferior”; “Argues a lot.”

ASD symptoms in the adolescent were also measured using the 10-item Autism Subscale (Camodeca, 2018) of the *Child Behavior Checklist* (CBCL; Achenbach & Rescorla, 2001; So et al., 2012) as part of the parental questionnaires. An example of an item is, “Repeats certain acts over and over; compulsions.” Answers ranged from 0 “Never” to 2 “Often.” Reliability of these subscales has been shown to be acceptable to good (respectively, $\alpha=0.89$; $\alpha=0.72$; $\alpha=0.81$; $\alpha=0.81$; $\alpha=0.74$; $\alpha=0.75$). The adolescents’ measure excluded the items on ASD symptoms, because no information regarding the reliability of the self-report ver-

sion of the ASD subscale was available. The assessed subscales on adolescent internalizing and externalizing problem behavior have been shown to have acceptable to good reliability (respectively, $\alpha=0.81$ and $\alpha=0.74$; Achenbach et al., 2011; Rodenacker et al., 2015).

Parenting Problems. The questionnaire for parents also included the validated subscale *Parenting Problems of the Parenting Stress Questionnaire (– short form)*. This subscale consists of 7 items in the full version and 4 items in the short form, with answers ranging from 1 “*Not at all true*” to 4 “*Completely true*” (*Opvoedingsbelastingsvragenlijst– Kort* in Dutch; Vermulst et al., 2015). An example of an item is, “*I know I am doing a good job as a parent.*”

The questionnaires used to assess the primary outcomes were largely similar between Study 1 and Study 2. However, for the primary outcomes for parents, in Study 2 the full Parenting Problems subscale of the *Parenting Stress Questionnaire* (Vermulst et al., 2015) was used rather than just four of its items. This decision was made in order to be able to use published information on the reliability of the full Parenting Problems subscale. The reliability of this subscale has been shown to be good– both the full version ($\alpha=0.82$; Vermulst et al., 2015) and the brief version ($\alpha=0.89$; Delsing, 2022).

The primary outcome measures were used to calculate a Reliable Change Index (see below).

Secondary Outcomes: Personalized Treatment Outcomes

Secondary outcomes related to personalized treatment goals for each family, as deemed most important by the family and their MST therapist and supervisor. Family members participating in the study, the therapist, and supervisor were consulted to identify these treatment outcomes, which were then translated into personalized questions that differed per family (all scored on a scale of 0 ‘*Fully disagree*’ to 10 ‘*Fully agree*’). In Study 1, the number of personalized treatment outcomes varied from five to nine, while in Study 2, the number of personalized treatment outcomes varied from two to three, depending on the treatment goals identified. These unique goals and personalized questions per family are described in the Results section and were used to evaluate changes over time, during treatment. When sufficient data was available (see below), scores on the personalized questions during the treatment phase were compared to scores during the intake phase.

Secondary Outcomes: Societal Indicators of Success

Societal indicators of the success of MST are routinely collected. These indicators (sometimes referred to as MST’s ‘Ultimate Outcomes’) pertain to the living situation of the adolescent (living at home– yes/no), police contacts of the adolescent (absent/present), and school going or job attainment of the adolescent (yes/no) and are measured at the start and end of treatment. The MST therapist reports these outcomes using the Social Demographic Information questionnaire (SDI; MST-Netherlands/Belgium, 2012) under supervision of the MST supervisor and the MST consultant from MST-Netherlands/Belgium (Blanckstein et al., 2019). These questionnaires were used as part of both Study 1 and 2. Although these measures are not used in any analyses, the descriptive findings are reported to provide a general understanding of the outcomes of treatment.

Other Sources of Data: Brief Interviews

At the end of each treatment, the MST therapist conducted a brief interview with the family. The interview consisted of seven questions, reflecting on parents and adolescents experiences with MST in general, parental satisfaction with treatment (rated on a scale of 1–10), and on treatment elements that were considered helpful or unhelpful by parents and adolescents, including both common intervention components and MST specific components. The interviews were conducted as part of Study 1 and 2. These qualitative data were used as a resource to contextualize and inform our understanding of the quantitative findings.

Analyses

The research question pertaining to the treatment outcomes and treatment effects of MST in families with adolescents with ASD was answered by evaluating the change on the four primary outcome measures (externalizing, internalizing, ASD related, and parenting problems) and evaluating the change over time during treatment on secondary outcomes (i.e., personalized treatment outcomes). Furthermore, a comparison of changes in secondary outcomes during the intake and treatment phases was conducted to evaluate treatment effects, followed by a meta-analysis of the treatment effects.

Change in Outcomes

Over-time changes in the outcome variables were assessed in two ways. Firstly, individual changes in the primary outcomes, namely adolescent internalizing and externalizing behavior problems, adolescents' ASD related problems, and parents' parenting problems were assessed by calculating the Reliable Change Index (RCI; Jacobson & Truax, 1991). For these calculations, scores at the start and end of treatment were used. The RCI indicates whether changes in scores were statistically significantly greater than differences in scores that could have occurred due to random measurement error alone. The formula for calculating the RCI includes the standard deviation in the reference sample and the test-retest reliability or internal consistency of the relevant scale. For our calculations, we used values reported by So and colleagues (2012) and Camodeca (2018) regarding the ASD scale, values reported by Rodenacker and colleagues (2015) regarding the internalizing and externalizing problem behavior scales, and values reported by Delsing (2022) and Vermulst and colleagues (2015) regarding the parenting problems scale. Analyses were two-tailed, with a p value < 0.05 . Consequently, an $RCI < -1.96$ indicated reliable negative change and a significant decrease in scores, whereas an $RCI > 1.96$ indicated reliable positive change and a significant increase in scores (Jacobson & Truax, 1991).

Secondly, change on the secondary outcomes, namely change during treatment regarding the family-specific measures, was assessed by calculating the Theil-Sen slope (Sen, 1968; Theil, 1950) and corresponding p value using *Single Case Research* (SCR), a web-based calculator (Vannest et al., 2016). The Theil-Sen slope, also known as Kendall's slope or a nonparametric linear regression slope, is an alternative for standard linear regression slopes. An advantage of the Theil-Sen slope is that it is relatively insensitive to outliers or extreme scores (Vannest et al., 2012).

Treatment Effects

Tau-U values (Parker et al., 2011) and corresponding p values were calculated to compare scores on the secondary outcomes, i.e. the specific repeated measures during the intake phase (Phase A) with scores during the treatment phase (Phase B). Again, this was done using the SCR web-based calculator. Tau-U is an effect size for single-case research that reflects the proportion of non-overlapping data between two subsequent phases while controlling for baseline trends (Geuke et al., 2019). To conduct Tau-U analyses, a sufficient number of measurements per phase is required (Ponsioen & Hoekman, 2021). In this study, Tau-U analyses were performed when at least three measurements per phase (A or B) were available (Kratochwill et al., 2010). This was the case for 8 respondents (32% of all respondents) from five different families (36% of all participating families).

Meta-Analysis of Treatment Effects

A meta-analysis was conducted by calculating the overall Tau-U effects of the secondary outcomes. These were calculated for Study 1 and 2 combined, all mothers, all fathers, and all adolescents, respectively. This was done on the basis of the Tau-U and its standard error (SD_{Tau}) per experiment-level AB phase contrast. For this purpose, the Meta Analysis module as implemented in SPSS version 29.0 was used.

Interviews

The interviews conducted as part of the described SCED studies contained questions relating to how families had experienced their treatment and what aspects of treatment they had perceived as helpful or unhelpful. While the interviews were conducted by the families' respective therapists, they were analysed by the research team. To this end, a rapid analysis technique was employed (Taylor et al., 2018; Vindrola-Padros & Johnson, 2020). While rapid analysis cannot replace more established techniques such as thematic analysis, it can be used in research studies, if properly implemented and by weighing its benefits and limitations (Vindrola-Padros & Johnson, 2020). Given the quality of the qualitative data, bearing in mind that the brief interviews were conducted by clinicians linked to the families, the research team opted for rapid analysis of the qualitative data.

Clinicians provided transcripts/reports of the conducted interviews to the research team. The first author deductively constructed matrices (Taylor et al., 2018), in which the transcripts/reports were divided up and entered into a spreadsheet for coding. The first and second author then coded the transcripts using a predefined coding scheme. The aim of the rapid analysis was to identify treatment components or elements that were considered to be (un)helpful, according to parents and adolescents. For this purpose, we coded (1) MST specific components, as well as four common elements, described by De Lange and colleagues (2025), namely (2) Emotional alliance, (3) Task alliance, (4) Hope & expectation, (5) Monitoring. Lastly, we coded (6) Achieved outcomes. MST specific components (1) contains interventions used as part of the MST treatment model, including BrainBlocks (Van de Ven & Erisman, 2019), making sequences to better understand behavior, and comments relating to the frequency of treatment sessions or the duration of treatment. Emotional alliance (2) relates to the creation of a safe and positive alliance between the therapist and clients. Task

alliance (3) relates to shared decision-making by the therapist and family members. This includes a shared understanding of the problem, and shared decision-making regarding the goals and the interventions to achieve them. Hope & expectation (4) entails activities to increase hope regarding positive outcomes following the intervention, including conversations around prior experiences with care, family members' ability to counteract (behavior) problems, and psycho-education. Monitoring (5) refers to continuous evaluation of whether treatment goals, as well as homework and session goals, are being achieved, including adapting the treatment approach when barriers are encountered. Finally, Achieved outcomes (6) entails outcomes that were mentioned by family members as having been achieved as a result of MST treatment. The authors also coded the valence of the code, i.e., whether the coded component was valued as positive or negative by the respondent(s). A description of the frequencies and patterns observed is provided in the Results section, including a description of the themes or comments underlying the codes.

Results

Differences in primary treatment outcomes were assessed using RCI analyses comparing end of treatment scores with start of treatment scores. The results of these analyses are presented in Table 1. Regarding the societal indicators of success, at the start of treatment, 100% of the adolescents were living at home, 64% had no police contacts, and 43% were school going or had a job. At the end of treatment, these percentages were 100%, 86%, and 57%, respectively.

^bThese respondents did not answer the questionnaires at the end of MST treatment. Therefore, no RCIs could be calculated.

To evaluate changes in the secondary outcomes during treatment and differences between intake (Phase A) and treatment (Phase B) scores, Theil-Sen slope and Tau-U analyses were conducted, respectively. Tau-U analyses could only be performed if a family member had at least three measurements in the intake phase (A) and at least three measurements in the treatment phase (B) (Table 2). This was the case for the mother of Family 2, the mother, father, and adolescent of Family 3, the mother of Family 8, the mother of Family 15, and both parents of Family 17. A full overview of all Theil-Sen slope and Tau-U values is included in Tables 3 and 4, respectively. Below, the findings are summarized for Study 1 and Study 2.

Study 1

Theil-Sen slope analyses revealed that the majority of parents reported positive change in the majority of their treatment goals during treatment ($n=5$). However, one parent reported negative change in the majority of their treatment goals, and three parents reported no or little change. Adolescents only reported undesired change on their treatment goals ($n=1$) or no or little change ($n=1$; see Table 4, Study 1).

The respondents for whom Tau-U analyses could be conducted reported desired effects in the majority of cases. The mother of Family 2 reported a reduction of verbal aggression of her child and the mother of Family 8 reported that her child complied with the rules at home more during treatment when compared to the intake phase. In contrast, in Family 3, the father reported that his child's compliance with the rules at home had worsened, while

Table 1 Reliable change index scores between start and end of MST treatment

RCI				
Respondent	External-izing behavior	Internal-izing behavior	ASD related behavior	Parent-ing problems
<i>Family 1</i>				
Mother	1.00	0.00	-1.18	0.00
Adolescent	0.00	-0.55	N/a	N/a
<i>Family 2</i>				
Mother	-1.51	0.00	0.00	0.00
Father	-4.02	-1.51	-1.58	2.69
<i>Family 3</i>				
Mother	1.51	2.01	1.58	-2.69
Father	1.00	0.50	0.39	-1.35
Adolescent	-0.52	-0.55	N/a	N/a
<i>Family 4</i>				
Mother	0.00	-1.00	-1.18	0.67
<i>Family 8</i>				
Mother	-2.51	0.50	-0.79	3.36
<i>Family 9</i>				
Mother	0.50	0.50	0.00	-0.67
Father	-0.50	0.00	-1.18	0.00
Adolescent	0.00	0.00	N/a	N/a
<i>Family 10</i>				
Mother	0.00	2.51	0.39	0.00
<i>Family 11</i>				
Mother ^b	-	-	-	-
Father	-1.00	0.00	-0.079	-0.56
<i>Family 12</i>				
Mother ^b	-	-	-	-
<i>Family 13</i>				
Mother	-1.00	-1.00	-1.18	3.39
Father	-1.51	0.00	0.00	1.69
<i>Family 14</i>				
Mother	-2.01	-1.00	-1.18	3.39
<i>Family 15</i>				
Mother	1.00	0.00	0.00	0.56
Father	0.00	0.50	-0.39	0.56
<i>Family 16</i>				
Mother ^b	-	-	-	-
Father	-2.01	-1.51	-4.33	1.13
<i>Family 17</i>				
Mother	-0.50	-1.00	0.00	2.26
Father	1.00	1.51	1.58	1.13

RCI of < -1.96 or > 1.96 indicate a reliable change.

The interpretation of whether an increased or decreased score is desirable depends on the subscale

Marked in Italics are undesirable changes

Marked in Bold are desirable changes

Table 2 Overall Tau-U effects

	ABs	Tau-U	<i>p</i>	CI ₉₅	
				Lower	Upper
Study 1	40	0.115	0.088	−0.017	0.247
Study 2	9	0.060	0.540	−0.131	0.250
Study 1 & 2	49	0.103	0.070	−0.008	0.214
Mothers	30	0.184	0.014*	0.038	0.330
Fathers	11	−0.014	0.919	−0.284	0.256
Adolescents	8	−0.033	0.772	−0.252	0.187

ABs refer to the number of AB phase contrasts

CI₉₅ = 95% confidence interval

**p* < .05.

the mother reported that the atmosphere at home had become less relaxed when compared to the intake phase. However, the parents did also report an improvement in their knowledge of how to best handle their child.

Study 2

Theil-Sen slope analyses revealed that the majority of parents reported desired change in the majority of their treatment goals during treatment (*n* = 7). Few parents reported no change (*n* = 2), but four parents reported undesired change in at least one out of three personalized treatment goals (see Table 4, Study 2).

Of the parents with sufficient measurements to conduct Tau-U analyses, only the mother of Family 15 reported a significant positive effect. Her child had made significant improvements in terms of school attendance (for at least 20 h a week) when compared to the intake phase.

Meta-Analysis

For the purpose of conducting a meta-analysis, overall Tau-U effects were calculated. This was done for Study 1 and 2 combined, mothers, fathers and adolescents, respectively, on the basis of the Tau-U and its standard error (*SD*_{Tau}) per experiment-level AB phase contrast. Table 2 shows the overall Tau-U effects resulting from these analyses. Only the overall Tau-U effect size for mothers was significant (*p* = .014), with an overall effect size of 0.184 (CI₉₅ = [0.38, 0.330]). Based on Vannest and Ninci's guidelines (2015) for small (≤ 0.20), moderate (0.21–0.60), large (0.61–0.80), and very large (≥ 0.81) effects, this constitutes a small effect.

Interviews

Interviews held with families by therapists contained valuable information that helped to understand and interpret the studies' quantitative results. On average, families rated their MST treatment at 8.4 on a ten-point scale (range 7.0–9.0). As described earlier, rapid analysis was used to analyse the transcripts/reports provided by the therapists. Across the fourteen conducted interviews, positive comments most frequently related to MST specific components (1; 26% of all 110 positive codes) and to Task alliance (3; 35% of positive codes, 21 in total). Family members appreciated the continuous analysis of situations and their driving factors (making sequences), as well as therapists directing family members back to the treatment's focus areas. All parents expressed that the shared decision-making

Table 3 Secondary outcomes and Theil-Sen slope values

Study	Secondary Outcomes	Respondent					
		Mother		Father		Adolescent	
1		Slope	<i>p</i>	Slope	<i>p</i>	Slope	<i>p</i>
1	My child is truant	0.000	1.000	—	—	—	—
	My child and I speak seldomly and are not attuned	0.061	0.009	—	—	—	—
	My child does not comply with the rules at home	0.000	0.786	—	—	—	—
	My child is cheerful	0.111	0.147	—	—	—	—
	I understand my child	0.000	0.239	—	—	—	—
	I know how to best handle my child	0.000	0.165	—	—	—	—
	I know how to apply my knowledge on how to best handle my child	0.080	0.003	—	—	—	—
2	My child is physically aggressive	-0.125	0.004	-0.177	0.000	—	—
	My child is verbally aggressive	-0.167	0.000	-0.059	0.054	—	—
	My child comply with the rules at home	-0.059	0.178	-0.125	0.004	—	—
	My child is truant	-0.214	0.001	-0.125	0.054	—	—
	My child pays attention to others	0.100	0.010	0.125	0.005	—	—
	I have clear rules and boundaries as a parent	0.000	0.205	0.063	0.001	—	—
	My partner and I apply the same rules and boundaries	0.053	0.027	0.000	0.086	—	—
	I know how to best handle my child	0.200	0.000	0.000	0.196	—	—
3	I know how to apply my knowledge on how to best handle my child	0.133	0.002	0.067	0.003	—	—
	My child is verbally aggressive	0.170	0.000	-0.091	0.080	0.000	0.568
	My child does not comply with the rules at home	0.177	0.000	0.000	0.284	0.000	0.053
	My child is too dependent on adults	0.125	0.000	0.000	0.128	0.271	0.002
	My child is easily overwhelmed	0.091	0.001	0.000	0.195	0.250	0.006
	There are a lot of fights or arguments at home	-0.067	0.006	-0.143	0.022	-0.103	0.078
	The atmosphere at home is relaxed/positive	-0.083	0.003	-0.083	0.150	-0.074	0.244
	I know how to best handle my child ^a	0.000	0.008 ^c	0.000	0.096	—	—
	I know how to apply my knowledge on how to best handle my child ^a	0.000	0.346	0.000	0.010 ^c	—	—
	I can easily be around my sibling ^b	—	—	—	—	0.000	1.000
4	My parents understand me ^b	—	—	—	—	0.031	0.922
	My child is physically aggressive	0.000	0.558	—	—	—	—
	My child is verbally aggressive at home	-0.096	0.087	—	—	—	—
	I am able to divide my attention between my children	0.000	0.787	—	—	—	—
	My child can entertain himself without a screen	0.000	0.322	—	—	—	—
	As a family, we get on each other's nerves	0.000	0.558	—	—	—	—
	I understand my child	0.000	0.224	—	—	—	—
	I know how to best handle my child	0.063	0.105	—	—	—	—
	I know how to apply my knowledge on how to best handle my child	0.042	0.105	—	—	—	—

Table 3 (continued)

Study 1	Family No	Secondary Outcomes	Respondent					
			Mother		Father		Adolescent	
			Slope	<i>p</i>	Slope	<i>p</i>	Slope	<i>p</i>
8		My child is physically aggressive	-0.111	0.001	—	—	—	—
		My child does not comply with the rules at home	-0.091	0.001	—	—	—	—
		My child is verbally aggressive at home	-0.100	0.003	—	—	—	—
		My child is verbally aggressive at school	0.000	0.574	—	—	—	—
		I understand my child	0.200	0.000	—	—	—	—
		I know how to best handle my child	0.217	0.000	—	—	—	—
		I know how to apply my knowledge on how to best handle my child	0.200	0.000	—	—	—	—
9		My child can entertain themselves without a screen	0.000	0.624	0.000	0.350	0.000	0.177
		My child does not comply with the rules at home	-0.133	0.004	0.000	0.388	0.000	0.589
		My child is verbally aggressive at home	-0.200	0.001	-0.150	0.001	-0.100	0.038
		My child is truant	-0.255	0.001	-0.162	0.010	0.000	0.344
		My child is too dependent on adults	-0.125	0.000	0.000	0.253	<i>0.167</i>	<i>0.027</i>
		I understand my child ^a	0.045	0.107	0.000	0.129	—	—
		I know how to best handle my child ^a	0.098	0.000	0.000	0.691	—	—
		I know how to apply my knowledge on how to best handle my child ^a	0.143	0.000	0.053	0.008	—	—
		I do not listen to my parents ^b	—	—	—	—	0.000	0.589
		I can easily be around my sibling ^b	—	—	—	—	0.000	0.558
		My parents understand me ^b	—	—	—	—	0.000	0.444
Study 2	Family No	Secondary Outcomes	Respondent					
			Mother		Father			
			Slope	<i>p</i>	Slope	<i>p</i>		
10		My child does not destroy objects belonging to others	0.000	0.570	—	—		
		My child listens to me	-0.026	0.062	—	—		
		I am able to control my child	-0.032	0.020	—	—		
11		My child destroys objects	0.192	0.000	0.056	0.002		
		My child goes to school	0.000	0.352	0.000	0.094		
		My child shouts and curses a lot	0.032	0.003	0.100	0.000		
12		I am able to calm my child down when they are angry	0.091	0.001	—	—		
		My child listens to me	0.136	0.000	—	—		
		I feel happy around my child	0.143	0.000	—	—		
13		My child has a good circadian rhythm	0.000	0.249	0.046	0.000		
		I understand my child	0.000	0.342	0.030	0.000		
		My child goes to school for a minimum of 20 h per week	0.036	0.009	0.154	0.000		

Table 3 (continued)

Study 2	Family No	Secondary Outcomes	Respondent			
			Mother		Father	
			Slope	<i>p</i>	Slope	<i>p</i>
14		My child has daily activities; goes to school or work	0.233	0.000	–	–
		My child complies with the rules at home	0.000	0.122	–	–
		My child asks for help in an appropriate way	0.083	0.000	–	–
15		My child is physically aggressive	0.000	0.802	0.000	0.754
		My child is verbally aggressive	<i>0.000</i>	<i>0.036</i>	0.000	0.111
		My child goes to school for a minimum of 20 h per week	0.000	1.000	0.000	1.000
16		My child is physically aggressive	0.000	0.407	0.000	0.093
		My child is verbally aggressive	–0.065	0.000	0.000	0.054
17		My child expresses physical aggression against objects at home	0.000	1.000	0.000	0.422
		My child is verbally aggressive at home	0.000	1.000	0.000	0.232
		My child has daily activities; goes to school or work	0.000	0.000	0.029	0.000

The interpretation of whether an increased or decreased score is desirable depends on the subscale. Marked in *Italics* are undesirable changes ($p < .05$). Marked in **Bold** are desirable changes ($p < .05$). Items relating to parenting were rephrased in adolescent measures, to reflect their perspective on the same (i.e., ‘*My child is verbally aggressive at home*’ was rephrased to ‘*I curse or shout a lot.*’)

^a These specific measurements were only administered as part of the parent measurement

^b These specific measurements were only administered as part of the adolescent measurement

^c The Theil–Sen Slope is calculated by identification of the median of the differences between measurements. As the majority of these differences were 0 for these respondents, the Theil–Sen Slope is 0.000 and significant due to small standard errors. Because the slopes are so small, they have to be interpreted with care and are not noted as significant results in the manuscript

process and partnerships between parents and therapists were helpful. Negative aspects that were brought up in the interviews also most frequently related to Task alliance (3; 62% of all negative codes) and MST specific components (1; 19% of negative codes). Parents mentioned that lack of consensus around treatment goals or approaches (specific interventions) contributed to negative experiences. Some parents felt treatment was too short, while others mentioned that the lack of engagement of their child in treatment was disappointing and did not match their initial expectations. Emotional alliance (2) was also frequently mentioned across interviews (19% of positive codes, 14% of negative codes). Family members mentioned the open and positive attitudes of therapists and that they felt seen and taken seriously by their therapist. Achieved outcomes (6) were mentioned fifteen times by family members, and only once in a negative context across the interviews (13% of positive codes, 5% of negative codes). The mentioned outcomes varied widely and related to, for example, improved mother–daughter relationships, more congruent parenting styles, and a better understanding of family members’ functioning. The codes Hope & expectation (4) and Monitoring (5) were mentioned much less frequently (only 9 times, 8% of positive codes). A few family members mentioned feeling empowered during treatment and felt it had been helpful that their therapist had paid attention to their negative experiences with

Table 4 Tau-U analyses of secondary outcomes

Family No	Secondary Outcomes	Respondent					
		Mother			Father		
		Tau-U	<i>p</i>	Tau-U	<i>p</i>	Tau-U	<i>p</i>
2	My child is physically aggressive	-0.196	0.539	-	-	-	-
	My child is verbally aggressive	-0.913	0.004	-	-	-	-
	My child does not comply with the rules at home	-0.272	0.394	-	-	-	-
	My child is truant	-0.500	0.117	-	-	-	-
	My child pays attention to others	0.424	0.183	-	-	-	-
	I have clear rules and boundaries as a parent	0.044	0.891	-	-	-	-
	My partner and I apply the same rules and boundaries	-0.522	0.101	-	-	-	-
	I know how to best handle my child	0.565	0.076	-	-	-	-
	I know how to apply my knowledge on how to best handle my child	0.500	0.117	-	-	-	-
	My child is verbally aggressive	0.281	0.375	0.568	0.076	-0.271	0.393
	My child does not comply with the rules at home	0.344	0.279	0.636	0.047	-0.042	0.896
	My child is too dependent on adults	0.188	0.555	-0.023	0.943	0.125	0.694
3	My child is easily overwhelmed	0.271	0.393	0.386	0.227	0.167	0.599
	There are a lot of fights or arguments at home	-0.094	0.768	-0.080	0.804	0.333	0.294
	The atmosphere at home is relaxed/positive	-0.719	0.024	0.046	0.887	-0.031	0.922
	I know how to best handle my child ^a	0.802	0.012	0.921	0.004	-	-
	I know how to apply my knowledge on how to best handle my child ^a	0.125	0.694	0.614	0.055	-	-
	I can easily be around my sibling ^b	-	-	-	-	0.021	0.948
	My parents understand me ^b	-	-	-	-	0.063	0.844
	My child is physically aggressive	-0.272	0.447	-	-	-	-
	My child does not comply with the rules at home	-0.728	0.041	-	-	-	-
	My child is verbally aggressive at home	-0.617	0.084	-	-	-	-
	My child is verbally aggressive at school	-0.370	0.300	-	-	-	-
	I understand my child	0.074	0.836	-	-	-	-
8	I know how to best handle my child	0.556	0.120	-	-	-	-
	I know how to apply my knowledge on how to best handle my child	0.321	0.369	-	-	-	-

Table 4 (continued)

		Respondent		
		Mother	Father	Adolescent
15	My child is physically aggressive	− 0.215	0.478	−
	My child is verbally aggressive	0.320	0.291	−
	My child goes to school for a minimum of 20 h per week.	0.750	0.013	−
17	My child expresses physical aggression against objects at home	0.000	− 0.040	0.895
	My child is verbally aggressive at home	0.000	0.120	0.692
	My child has daily activities; goes to school or work	0.136	− 0.155	0.609

The interpretation of whether an increased or decreased score is desirable depends on the subscale. Marked in Italics are undesirable changes ($p < .05$). Marked in Bold are desirable changes ($p < .05$). Items relating to parenting were rephrased in adolescent measures, to reflect their perspective on the same (i.e., ‘My child is verbally aggressive at home’ was rephrased to ‘I curse or shout a lot.’)

^a These specific measurements were only administered as part of the parent measurement

^b These specific measurements were only administered as part of the adolescent measurement

prior treatment. Although this was not consistent with any of the aforementioned categories, one family mentioned having experienced difficulties in responding to the adherence measures and the measures in the EthicaData app (Avicenna, 2023).

Discussion

The effects of MST delivered to families of autistic adolescents were assessed in two SCED studies, employing both quantitative and qualitative data. Overall, the RCI analyses conducted in Studies 1 and 2 indicate that of the 22 parents, six parents reported a significant improvement (27%), and two parents reported significant deterioration in the primary outcomes (9%). This means that the majority of the parents reported no significant change in the primary outcomes at the end of treatment compared to the scores at the start of treatment (63%). The Theil-Sen slope analyses revealed that of the 22 parents, the majority of parents reported positive change in the majority of their treatment goals during treatment ($n = 12$, 55%). 5 Parents reported negative changes in the majority of their treatment goals (23%) and 5 parents reported no or little change in their treatment goals (23%). In terms of treatment effects, only 6 out of 32 outcomes showed significant effects (19%); showing positive effects for three families, mixed effects for one family, and no effects for one family. The meta-analysis of the specific measures administered during the intake (A) and treatment (B) phases revealed no significant effects regarding the secondary outcomes in the combined samples of Studies 1 and 2. However, the mothers' reports revealed a small overall positive effect (0.184) of the treatment. Qualitatively, conducted interviews revealed that 84% of all interview codes were positive (131 codes; 110 positive codes). The most described positive common intervention component was the working alliance between family members (emotional bond and task alliance), as well as MST specific interventions used during treatment or MST treatment principles. Similarly, the most frequently described negative elements related to the same categories.

A larger number of maternal AB measurements were evaluated than paternal or adolescent measurements. This in part relates to the inclusion of single-parent families in our studies. In total, 37% of the adolescents were living in a single-parent household (with their mother) at the start of MST treatment. Historically, most research has not considered differences in mothers' and fathers' outcomes following intervention for young autistic people with behavioral problems (Hayes & Watson, 2013; Rankin et al., 2019). Research that has examined fathers' and mothers' experiences of parenting stress in relation to adolescent behavioral problems suggests that fathers generally report lower levels of outcomes such as parenting stress (De Maat et al., 2021). More positive father' ratings of family functioning may explain why treatment effects were found for mothers but not for fathers. RCI, Theil-Sen Slope, and Tau-U analyses conducted as part of the two SCED studies also show differences in the perspectives of parents.

Both Family 3 and 10 reported a deterioration of the situation at home, with increased adolescent internalizing and parenting problems for Family 3 (RCI analysis of mother's scores) and increased adolescent internalizing problems for Family 10 (RCI analysis of mother's scores). Experiences of (increased) parenting problems during treatment are undesired, but not uncommon (Tarver et al., 2019). Consultation with clinicians revealed that the adolescent in Family 3 was placed out-of-home towards the end of treatment due to severe

internalizing problems and psychiatric needs. Family 10 also required additional support following MST treatment to address the internalizing problems of the adolescent. While this may seem surprising, MST treatment is not able to treat acute suicidal/psychotic/homicidal behaviors or internalizing psychiatric problems (Henggeler et al., 2009). Many studies on treatment types targeting behavioral problems of young autistic people also do not include internalizing problems as an outcome measure (Tarver et al., 2019), despite these being linked to behavioral problems such as aggression (Brown et al., 2021; Hill et al., 2014; Tarver et al., 2019).

Taken together, the findings from the two SCED studies indicate a need for additional support if and when ASD related problems and internalizing problems turn out to be more severe than observed during the intake phase. Strong partnerships with providers of specialized ASD care are essential to create successful maintenance of treatment results and post-treatment handovers when needed, for example when internalizing problems of autistic adolescents prove more severe than assessed at intake. For those autistic adolescents with severe internalizing or comorbid psychiatric needs, specialized treatment such as MST-Psych (e.g., Rowland et al., 2005) may also be more fitting than MST treatment. As MST-Psych has only recently become available in the Netherlands, families of autistic adolescents with severe internalizing problems or psychiatric needs may benefit from cross-consultation between MST and MST-Psych supervisors.

Two (out of two) adolescents reported having become more dependent on adults during treatment. Recent research on levels of parent-child dependency suggests that autistic children and their families may benefit from parents providing a level of support that would be considered ‘too much’ for typically developing children (Walton & Tiede, 2020). Various studies found that this increased parent-child interdependence, sometimes flagged as maladaptive or ‘enmeshment’, is not predictive of poorer outcomes in families of autistic children (Altiere & Von Kluge, 2009; Walton & Tiede, 2020). Whether considered adaptive or maladaptive, the finding that two autistic adolescents experienced increased dependence on adults has to be interpreted with caution and would need replication, given the very small number of adolescent reports in our two SCED studies.

Taking the previous into consideration, it is important to note that while a majority of parents reported desired changes during treatment (i.e., Theil-Sen slope analyses; 55% of parents), no treatment effects were found on a large majority of secondary outcomes (i.e., Tau-U analyses of personalized treatment outcomes; 81% of outcomes). *When* changes or effects were observed, these tended to be positive. The conducted meta-analysis revealed no overall effect for the entire study population, but did show a small positive effect of treatment according to mothers. Interestingly, qualitatively, family members reported quite positive experiences with MST treatment in their interviews, that were in part also observed during treatment (see findings from RCI-analyses and Theil-Sen slope analyses); 84% of all interview codes were positive. To contextualize the quantitative findings from both SCED studies, these were compared to the qualitative codes. While the outcomes achieved through MST treatment were not the primary focus of the interviews, 11% of all codes pertained to treatment outcomes mentioned by family members. The coding of the interviews revealed that family members sometimes mentioned achieved outcomes not captured in the (quantitative) primary and secondary outcome measures. For example, the mother of Family 8 noted in her interview that the atmosphere at home had become more relaxed, but this outcome was not measured as part of her quantitative outcomes. Similarly, the parents of

Family 15 reported that they had gained a better understanding of the factors contributing to problems and had achieved more congruent parenting styles. These outcomes were not measured and, therefore, not observed quantitatively. 5% Of all interview codes related to negative outcomes of MST treatment. For example, Family 11 reported that the treatment goals around reductions in truancy and internalizing problems were not met. This was not observed in the RCI or Theil-Sen slope analyses. The differences between the observations from the qualitative data (largely positive findings) and the quantitative data (a lack of change, but *when* change was observed it was mostly positive) shows that collecting both types of data can lead to different insights.

Given the Tau-U findings, the observed quantitative study findings cannot be attributed to the MST treatment with a high degree of certainty. The Tau-U findings and lack of significant change thereof may, in part, be due to the very short intake phases ahead of MST treatment and the relatively small samples used in the meta-analyses, resulting in a potential lack of power. Also, this observational study employed an AB design to assess treatment effects, as many SCED studies have done previously (Maric & Kok, 2023). However, stronger designs exist that, for example, employ randomization in terms of when treatment is delivered (multiple baseline SCEDs; Gosens et al., 2023) or repeat study phases (ABAB; Kratochwill et al., 2010). With traditional two-phase AB designs, replication is usually needed (Kratochwill & Levin, 2010). As such, the current study needs to be replicated across multiple samples to provide stronger evidence and firmer conclusions. Nevertheless, the conducted meta-analysis provides additional insight into treatment effects. To summarize, the conducted SCEDs— including the generated quantitative and qualitative data— contribute to the evidence base of MST for families of adolescents with an ASD level 1.

Limitations and Lessons Learnt

A first limitation of the current study lies in the number of participants for whom Tau-U analyses could be conducted. The majority of participants (>50%) did not have sufficient measurements in the intake phase to allow for a comparison of treatment and intake phase scores. This is especially salient for the few adolescents that participated in both studies. Despite the unavailability of Tau-U for the majority of the respondents, the present study does meet the minimum requirement for demonstrating treatment effects (minimum $n=3$, current study $n=8$; Krasny-Pacini & Evans, 2018).

One of the lessons learnt from Study 1 to Study 2 was that increasing the frequency of the measurements did not allow for the collection of sufficient measurements in the intake (A) phase. In fact, the number of Tau-U measurements completed as part of SCED Study 2 was much lower than in SCED Study 1 (see Table 2). In MST, the time between the initial intake and start of treatment is usually very brief, sometimes as a result of acute family crises at the onset of treatment. This may mean that a comparison of different (pre-[treatment]) phases may not be the most suitable observational study design. Future research could either opt to collect data from families that are on a waiting list or include a follow-up phase (C) to strengthen the study design (Maric & Kok, 2023).

Another limiting factor was that no adolescents participated in SCED Study 2. This was surprising because two adolescents had downloaded the EthicaData app (Avicenna, 2023) and consented to participate in the study. While the data collection was actively monitored and families were being contacted by the research team during non-response phases, the

research team and clinicians did not manage to actively engage adolescents in Study 2. This means that the overall results from adolescents need to be interpreted with great caution and that, ideally, future research puts increased efforts into engaging adolescents in research on MST for families of young autistic people, for example by asking them how they would like to be contacted or involved. This could be achieved by facilitating an in-person briefing from the researcher to the client. In this briefing, to ensure respondents understand the items, questionnaires could be discussed (see for example Gosens et al., 2023).

A final limitation lies in the design of the interviews conducted as part of this study. Having them conducted by the therapists involved in treatment rather than the research team, could have led to bias and ‘desired’ responses from informants. Moreover, the rapid analysis used does not allow for an in-depth analysis of families’ answers. The authors posit that the limited depth of the interviews warrants the identification of rapid analysis as the most suitable method to analyze the data with, despite its limitations. Future research could opt to have more in-depth interviews and thematic analysis conducted to map the experiences of families receiving MST treatment more rigorously.

Conclusions

The conducted practice-based and observational SCED studies provide valuable insight into treatment delivery of MST to families of young people with severe behavior problems and an ASD. The findings from the studies reveal that, quantitatively, little treatment effect was observed. However, in 84% of interview codes, family members reflected positively on treatment (elements) when describing their experiences with treatment. Also, *when* changes or effects were observed, these tended to be positive. More research seems necessary to provide more robust study results and a better understanding of how to best support these families. For families of adolescents with more severe internalizing or psychiatric problems, other treatment models (such as MST-Psych) may be more appropriate.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s10566-025-09873-5>.

Acknowledgements This manuscript is the result of a collective effort to facilitate practice-based research in mental health care in the Netherlands. The authors would like to thank the research interns who assisted in the communications with families and clinicians involved in this research. Our appreciation also goes out to the MST therapists and supervisors involved in the treatments that were assessed. We also thank the MST expert at MST Netherlands/Belgium who assisted in the interpretation of the results. Lastly, we extend our gratitude to the care manager and programme manager involved in these studies. The studies were made possible thanks to funding received from *Gemeenten Jeugdhulpregio Noordoost Brabant* (#10993061).

Funding Funding for the research described in the manuscript was received from *Gemeenten Jeugdhulpregio Noordoost Brabant* (#10993061).

Declarations

Conflict of interest The authors involved in the described studies all declare no conflict of interest.

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