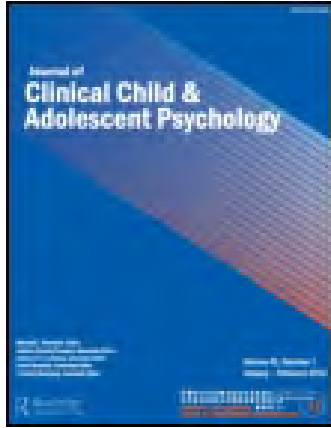


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The Swedish Implementation of Multisystemic Therapy for Adolescents: Does Treatment Experience Predict Treatment Adherence?

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Treatment effects may not be observed if an empirically supported intervention is not administered with treatment adherence. This retrospective study investigated how therapists' adherence to Multisystemic therapy (MST) varied during a 6-year period in Sweden. Adherence was measured using the Therapist Adherence Measure, which was provided by caregivers. The associations between treatment adherence and therapist-reported posttreatment youth outcomes were also assessed. Retrospective adherence data were obtained for 973 families with youths between 12 and 17 years old who received MST from 68 therapists divided into 10 teams. Implementation of MST occurred in 2 waves between March 2003 and August 2009. Multilevel structural equation modelling was used to evaluate family- and cohort-level predictors and outcomes of treatment adherence. The results confirm previous research: Treatment adherence predicts MST treatment outcomes. With respect to the relationship between MST treatment experience and MST treatment adherence, the analysis showed mixed results. An increase in years that a team had been active predicted an increase in therapist adherence to MST. Therapists from the 2nd implementation wave had higher therapist adherence rates than therapists from the 1st implementation wave. Nevertheless, a therapists' experience with MST did not predict MST treatment adherence. The results suggest that the found links among treatment experience, treatment adherence, and treatment outcomes provide support for the hypothesis that the collective experience of the team members promotes treatment adherence. However, results are mixed and further research is needed.

In Sweden, evidence-based practice is a matter of great interest to both policymakers and practitioners (Sundell, Soydan, Tengvald, & Anttila, 2010). An important component of evidence-based practice is the use of effective interventions with empirical support from clinical

trials. This requires knowledge of how to transfer these empirically supported interventions (ESI) to real-world settings while maintaining effectiveness. To ensure that the same outcomes are observed in practice as in the original efficacy and effectiveness studies, successful implementation in real-world practice settings requires high fidelity to the ESI's critical components (Bond et al., 2001; Ganju, 2003; Moser, DeLuca, & Bond,

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2004; Mowbray, Holter, Teague, & Bybee, 2003). However, when an ESI is implemented in a different context, the ability to replicate original effects is complicated by tension between the need to implement the intervention with fidelity and the need to adapt the intervention to the new context and culture (Fraser, Richman, Galinsky, & Day, 2009).

This study investigated treatment adherence, a key dimension of treatment fidelity (Waltz, Addis, Koerner, & Jacobson, 1993), in the Swedish implementation of Multisystemic Therapy (MST). Treatment adherence rests on the therapist's ability to adhere to an outlined protocol or manual (Perepletchikova, Treat, & Kazdin, 2007). It is usually described as independent of context because the treatment elements are expected to be independent of who the client is or the circumstances in which treatment occurs (Barber, Sharpless, Klostermann, & McCarthy, 2007). Thus, treatment adherence differs from therapist competence, a separate dimension of treatment fidelity that refers to the level of skill and degree of responsiveness demonstrated by the therapist when delivering the technical and relational elements of treatment (McLeod, Southam-Gerow, & Weisz, 2009; Perepletchikova et al., 2007). Although treatment adherence is a theoretically important aspect of treatment delivery, few empirical studies have measured adherence (Naleppa & Cagle, 2010), and even fewer studies have reported associations between treatment adherence and client outcomes (Webb, DeRubeis, & Barber, 2010). Therefore, the present study addresses this gap in the literature by evaluating the relationship between treatment adherence and experience implementing MST over 6 years of treatment in Sweden and whether the MST treatment adherence was related to therapist-reported youth outcomes.

TREATMENT ADHERENCE IN MULTISYSTEMIC THERAPY

MST (Henggeler, Schoenwald, Borduin, Rowland, & Cunningham, 2009) is an intensive family- and community-based treatment program in which the therapists are on call 24 hr a day, 7 days a week. Treatment length usually ranges from 4 to 5 months. The targeted group is youths between 12 and 17 years old with serious antisocial behaviour that includes problems with the law. Clinicians are organized into teams of three or four therapists and a clinical supervisor, supported by an MST expert consultant. MST therapists carry a caseload of four to six families at a time and vary the frequency and duration of treatment contacts to the circumstances, needs, and strengths of each family throughout the treatment. Nine treatment principles and a specified analytic process guide the clinical

formulation process, MST assessment, and intervention strategies (Henggeler et al., 2009).

An integral part of MST is its continuous measurement of therapist adherence (Henggeler, Melton, Brondino, Scherer, & Hanley, 1997; Henggeler, Pickrel, & Brondino, 1999), supervisor adherence (Henggeler & Schoenwald, 1998; Henggeler, Schoenwald, Liao, Letourneau, & Edwards, 2002), and expert consultant adherence (Schoenwald, Sheidow, & Letourneau, 2004). Research has demonstrated that MST therapist adherence is related to treatment outcomes. Higher adherence is associated with favourable long-term criminal outcomes, out-of-home placement outcomes, improvements in youth behaviour, and improvements in family functioning (e.g., Schoenwald, Carter, Chapman, & Sheidow, 2008; Schoenwald, Chapman, Sheidow, & Carter, 2009; Schoenwald, Sheidow, Letourneau, & Liao, 2003).

Studies exploring the relationship between treatment adherence and factors that might affect the therapist's ability to adhere to MST provide mixed results. Some primary caregiver variables are associated with higher adherence—such as low education, poorer economic conditions, expectations about the therapeutic process, and ethnic and gender similarity in therapist–caregiver dyads (Chapman & Schoenwald, 2011; Ellis, Weiss, Han, & Gallop, 2010; Schoenwald et al., 2003; Schoenwald, Letourneau, & Halliday-Boykins, 2005); however, indicators of the severity of youths' problems, age, or gender do not seem to be correlated with treatment adherence (Schoenwald et al., 2005). Furthermore, no relationship has been found between treatment adherence and therapist variables such as approval of the MST model, perceived similarity of MST to treatments the therapist has used in the past, the extent of professional training, or if the therapist had more or less than 3 months of experience practicing MST (Schoenwald et al., 2005). In contrast, higher therapist adherence is related to organizational characteristics such as opportunities for therapist's growth and advancement and job satisfaction (Schoenwald et al., 2009).

To date, research focusing on potential contributing factors to therapist adherence in MST has been conducted in the United States as part of the evaluation of MST's transportability to real-world settings. However, less is known about how the amount of time allocated to MST implementation may affect therapist adherence. To our knowledge, there are no studies that provide data on changes in treatment adherence over time for an empirically supported youth intervention. To this end, this study uses data from 6 years of MST treatment in Sweden to evaluate whether treatment adherence increased as therapists, teams, and the organization gained experience with MST and to assess the relationship between adherence and youth outcomes as reported by therapists.

METHODS

Participants

MST teams in Sweden. Referrals to MST in Sweden are made by the child and welfare services. In Sweden, youths with severe behaviour problems (including juvenile offenders) are almost entirely aided using a child welfare approach, which is in contrast to the situation in the United States, where juvenile offenders are processed by the juvenile court system. In 2003, child welfare authorities from three of Sweden's metropolitan areas and one smaller town collaboratively launched the implementation of MST and formed an organization called MST Sweden. This organization included a steering group that coordinated the initial implementation of MST by seven teams spread over 36 Swedish municipalities. During a second wave of implementation in 2005 and 2006, three additional teams began to implement MST in smaller towns in six additional municipalities. Seven of the 10 teams were operated by municipal social welfare authorities, and three were operated by nonprofit private organizations.

MST Services, LLC, is licensed by the Medical University of South Carolina (USA) to disseminate MST technology. MST Services supported MST implementation in Sweden between 2003 and 2007. Since 2007, MST Sweden, an MST Network Partner, has supported MST implementation in Sweden.

MST therapists. The 10 Swedish MST teams included a total of 68 therapists and 21 supervisors. Four consultants supported both therapists and the supervisors. The majority ($n = 45$; 66%) of the therapists were female. Information about the level of the therapists' educations was not available. An earlier study, however, showed that all Swedish MST therapists included in that study held degrees equivalent to a bachelor's or master's degree. The majority of these degrees were in social work. Psychology and educational sociology degrees were also represented. About half of the therapists had additional training in either family therapy or cognitive-behavioural therapy (Sundell et al., 2008).

Youths. A total of 1,158 youths (60% male) and their families participated in MST during the study period. All youths were referred to treatment by the child and welfare services due to severe behaviour problems including juvenile delinquency, severe problems at school, and being at risk of out-of-home placement. The average treatment lasted 147 days ($SD = 40.3$). In a majority (80%) of the cases, MST was terminated as planned due to a mutual agreement between the primary

caregiver(s) and the MST team. However, a minority of cases were prematurely terminated due to the inability of the MST team to engage the families in the treatment (7%), youth placement in a detention centre because of ongoing delinquent behaviour (7%), administrative issues, or decisions by the funding source that were unrelated to the progress of the case (5%). No information was available on age, ethnicity, family relations, youth referral reasons, or socioeconomic status.

Measures

Therapist Adherence Measure (TAM). TAM evaluates the therapist's adherence to the MST model as reported by the primary caregiver, obtained monthly by agency staff other than the family's therapist.

The original TAM (Henggeler & Borduin, 1992) was a 26-item scale developed to support and monitor therapist treatment adherence to MST. Items on the TAM refer to issues identified as important for successful treatment such as "The therapist tried to understand how my family's problems all fit together," "My family knew exactly which problems we were working on," and "The therapist's recommendations required family members to work on our problems almost every day." The TAM items are rated on a 5-point Likert-type scale, with response options ranging from 1 (*not at all*) to 5 (*very much*). The ratings were reported to the MST Institute to ensure that therapists adhered to the model while working with the individual family. Because TAM ratings were periodically compiled and analysed for each therapist and each team, the instrument also facilitated continuous monitoring of development and need for training.

During the adaptation process to the Swedish context, TAM was translated and back-translated to English to ensure that the translation was correct. A revised measure, the TAM-R (Henggeler, Borduin, Schoenwald, Huey, & Chapman, 2006), was introduced in Sweden in March 2007. TAM-R is a further developed 28-item TAM scale that retains 19 of the 26 items of the original TAM. As with TAM, TAM-R items are rated on a 5-point Likert scale with response options ranging from 1 (*not at all*) to 5 (*very much*). During the development of TAM-R, psychometric analyses were conducted on the original 26 TAM items and 12 new items using a Rasch-based approach to scale development. Based on the analysis, 19 of the original TAM items and nine of the new items were retained to comprise a single factor scale (Schoenwald, 2008). Therefore, the 19 original TAM items can be regarded as the most essential items represented in both versions. Consistent with psychometric evaluation of the single factor TAM, TAM-R ratings have been found to be stable within a family's treatment episode (Schoenwald, 2008).

In this study, data from both TAM and TAM-R were used. This combination was required because the introduction of TAM-R in 2007 occurred in the middle of the period covered by this study. Study analyses are solely based on these 19 TAM items shared by both TAM and TAM-R. For each individual, the sum of the 19 included items (rated on a scale of 1 to 5) was taken in order to utilize as much variation as possible (range = 19–95). This sum was used in all analyses. The internal consistency of the set of 19 selected items was high regardless of whether it was calculated on the basis of the TAM ratings ($\alpha = .86$), TAM-R ratings ($\alpha = .90$), or the combined data set ratings ($\alpha = .88$). Furthermore, there was a significant positive correlation between the total score based on the 19 selected items and total scores based on the 26 TAM or 28 TAM-R items: $r(n = 973) = .75, p < .01$. Together with the high internal consistency, the high significant positive correlations between the total score based on the 19 items, and the total scores based on TAM and TAM-R, respectively, this supports the combined data set as a viable approach for managing the two versions.

The mean number of TAMs provided by caregivers was 3.03 ($SD = 1.4$), and the majority (67%) provided between two and four TAMs. The average of the total TAM scores for each case was taken to represent the mean level of therapist adherence experienced by the family during a treatment episode.

Implementation wave. Therapists in the first seven Swedish MST teams were considered participants in the first wave of implementation, which started in 2003. Therapists in the three teams that started in 2005 and 2006 were considered participants in the second wave of implementation. The date therapists began to implement MST reflect the date when the first registered family initiated MST treatment with a therapist from a separate team. A dichotomous indicator variable was used to signify wave (0 = Wave 1 and 1 = Wave 2). Conceptually, implementation wave provided a marker of organizational MST experience, that is, experience not attributable to the individual therapist or therapist team.

Years of team activity. This measure was selected as an indicator of team experience. Years of team activity represented the number of years that a team had been active at the time the family began treatment (i.e., a team was coded as having zero years of experience if the treatment began in May 2004 and the team's first experience of giving MST was in October 2003). Because the seven first-wave teams had been active for 6 years by the end of the study period, years of team activity ranged from zero to five ($M = 2.31, SD = 1.6$). Years provided a useful unit of measurement of team

experience because 1 year provides sufficient time for underlying team processes to be established in a way that distinguishes team experience from therapist experience (e.g., processes involved in training, supervision, and development) and because it is easily interpretable.

Therapist experience. Therapist experience was measured as the number of previous families to whom the individual therapist had provided MST. This measure ranged from one to 45 families ($M = 12.3, SD = 9.1$).

TAM interview language. In Sweden, MST is provided to both families with Swedish as a first language and families with other first languages. Therefore, in 22% of the cases, the TAM interview was conducted in a language other than Swedish. To evaluate the potential impact of TAM interview language on treatment adherence and youth outcomes, a dichotomous indicator was used to signify whether the TAM was conducted in Swedish or a different language (1 = Swedish language, 0 = not Swedish).

Posttreatment youth outcomes. Upon completion of a youth and family's treatment, the supervisor registers the status of youth with respect to three therapist-reported youth outcomes. The entry for each outcome is dichotomous (i.e., yes or no). The youth outcomes are whether the youth (a) lived at home, (b) was engaged in school or work, and (c) had exhibited criminal behaviour. The first and second outcomes represent the circumstances on the last day of treatment. The third outcome refers to all criminal behaviours exhibited during the entire treatment period. Information about whether the youth lived at home and were engaged in school or work relies on reports from family members and direct contact with schools. Swedish police are obliged to report to the social welfare authorities when a youth younger than 18 years old is suspected of a criminal offense. Thus, the supervisors were able to base their report to the MSTI on this measure of social service records.

Procedures

The MST Institute (MSTI; www.MSTInstitute.org) is a nonprofit organization that provides web-based information and quality assurance tools for aiding implementation of MST. MSTI provides data collection, monitoring, and reporting tools to licensed MST programs, their funders, and MST experts to use for continuous quality improvement. In this study, the TAM measurement was administrated and then entered into the MSTI website by a staff person working in the

organization that housed the MST team. Apart from TAM, this study also included information from MSTI on the registered team and therapist of the family, date when treatment started and ended, youth gender, TAM interview language, and the therapist-reported youth outcomes. This additional information was registered on the MSTI website by MST supervisors at initiation and completion of each case.

Data Analysis Strategy

Data analysis used Mplus 6.0 (Muthén & Muthén, 1998–2010) for multilevel structural equation modelling. Final analyses used a robust FIML estimator for non-normal and dependent data (robust maximum likelihood). Preliminary analyses of model fit used a weighted least squares mean and variance adjusted estimator to provide an initial idea about the chi-square-based global model fit. Following the recommendations of Bollen and Long (1993), examination of model fit included indices of absolute fit, indices of relative fit, and indices of fit with a penalty function for lack of parsimony. The standardized root mean square residual compares the observed covariance matrix against that constructed through the model. The comparative fit index (CFI) and the Tucker-Lewis index (TLI) compare the hypothesized model with the independence model. The root mean square error of approximation (RMSEA) accounts for the error of approximation in the population. A standardized root mean square residual less than .05, CFI and TLI values greater than .95, and an RMSEA less than .08 were used to indicate good model fit.

Missing data. A total of 1,158 young people were treated using MST during the period. Of those, 155 (13%) had no registered TAM data and were therefore excluded from the analyses. The 1,003 youths with at least one TAM/TAM-R interview included 30 youths with more than three of 19 TAM/TAM-R items missing. These 30 youths were excluded from further analyses. These exclusions resulted in a final sample size of 973 youths. The 185 youths that were excluded did not differ significantly from the 973 youths in the final study sample according to gender (proportion male: included = 59%, excluded = 68%), $\chi^2(1) = 2.83$, $p > .05$. However, the excluded youths were more likely to come from families in which the TAM interview was conducted in a language other than Swedish (included = 23%, excluded = 29%), $\chi^2(1) = 5.58$, $p < .05$, and were more likely to have experienced premature termination of their treatment (included = 14%, excluded = 57%), $\chi^2(1) = 175.35$, $p < .001$.

Missing values on three or fewer TAM/TAM-R items were relatively infrequent (on average 1.8%,

varying between 0.3 and 3.7%) and were handled in a single variable imputation (Widaman, 2006) before averaging family TAM/TAM-R scores. Missing values were imputed using the Statistical Analysis Software (version 9.1.3) multiple imputation procedure with the Markov chain Monte Carlo method following the recommendation of Rubin (1987, 1996); Schafer (1997); and van Buuren, Boshuizen, and Knook (1999). Missing value imputation resulted in marginal differences in results.

Multilevel structural equation modelling analyses included five variables other than TAM/TAM-R that had missing data. Each posttreatment outcome (whether youth lived at home, were engaged in school or work, and had exhibited criminal behaviour) was missing data on 10 to 12 cases (approximately 1% missing). Gender and TAM interview language covariates were missing data on 19 and 14 cases, respectively (approximately 2% missing). To avoid dropping cases with missing data on covariates, we used Bayesian estimation and the sequential regression method in Mplus to impute 10 data sets with an unrestricted H1 model (Asparouhov & Muthén, 2010). Data were imputed for all five variables with missing values.

RESULTS

Preliminary Family-Level Model

Descriptive analyses (Table 1) of family-level data indicated that most of the youths lived at home (92%), were engaged in school or at work (78%), and had not exhibited criminal behaviour (84%) at treatment completion. As can be seen in Table 1, TAM scores were skewed and the mean TAM score was at the upper end of the range (TAM score range = 19–95).

To gain an initial idea about the chi-square-based global model fit at the family level prior to building a multilevel model, a single-level model was evaluated. In this model, therapist experience, youth gender (1 = male, 0 = female), and TAM interview language (1 = Swedish, 0 = not Swedish) predicted TAM scores. TAM scores, in turn, predicted whether youths lived at home, were engaged in school or work, and/or had exhibited criminal behaviour during the treatment episode (Figure 1, family level). Therapist experience was measured at the time the family began treatment. Because the youth outcome variables were dichotomous, model fit was evaluated using a robust weighted least-squares estimator in Mplus (weighted least squares mean and variance adjusted; L. K. Muthén & Muthén, 1998–2010). Fit indices did not meet criteria for good fit, $\chi^2(6) = 25.02$, $p < .001$ (CFI = .94, TLI = .81, RMSEA = .06, WRMR = 1.06). Based on a modification index of 19.58, a path was added to represent the direct effect of gender on whether youth

TABLE 1
Descriptive Statistics

Continuous Variables	<i>M</i>	<i>SD</i>	Range	Skewness	Kurtosis
Therapist Experience	12.27	9.07	1–45	0.90	0.38
Years of Team Activity	2.31	1.60	0–5	0.15	–1.07
TAM	81.38	9.76	28–95	–1.23	2.30
Dichotomous Variables	%				
Male	60.0				
Swedish Language	78.0				
Implementation Wave 2	23.0				
Home	92.0				
School/Work	78.0				
New Arrests	16.0				

had exhibited criminal behaviour at the end of treatment. Fit indices for the modified model were consistent with good model fit, $\chi^2(5) = 5.37$, $p = .37$ (CFI = 1.00, TLI = 1.00, RMSEA = .01, WRMR = .48).

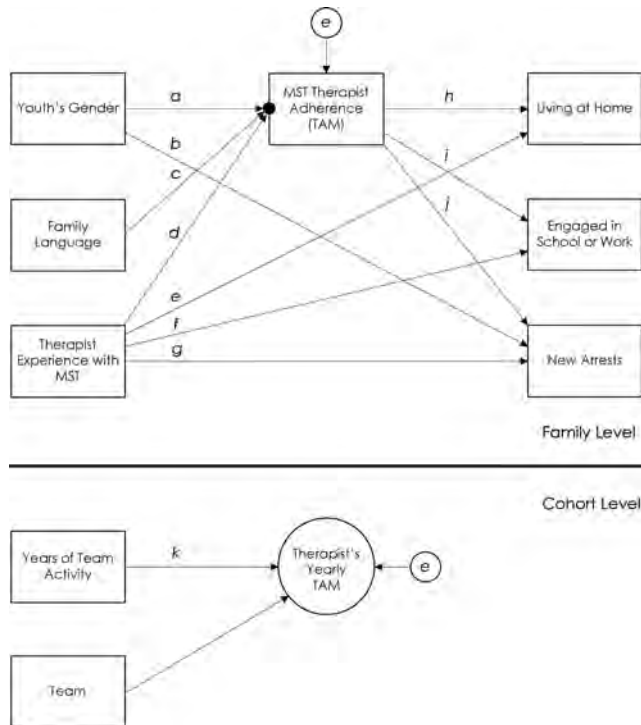


FIGURE 1 Visual representation of the two-level model used to evaluate predictors and outcomes of multisystemic therapy (MST) treatment adherence (TAM). Note: Variables above the line were measured at the family level, whereas years of team activity was measured at the cohort level. In the analysis, membership in the 10 therapist teams was represented by a set of nine dummy-coded variables; in Figure 1, therapists' team membership is represented by a single box to enhance visual clarity. The small filled circle represents the random intercept of TAM, which was allowed to vary across cohorts. At the cohort level, therapist's yearly TAM is the TAM intercept-as-outcome. Circles with the letter "e" are error terms that represent unexplained variance. TAM's cohort-level error term represents unexplained variance in its random intercept.

Multilevel Structural Equation Modelling

The family-level analyses provided the basis for specifying a multilevel structural equation model of families ($n = 973$) nested within cohorts. A "cohort" was defined as all the families that began treatment with the same therapist during the same year of implementation. Therefore, cohorts ($n = 201$) were also nested within therapists ($n = 68$), and therapists, in turn, were nested within teams ($n = 10$). To account for this nonindependence, we used the TYPE = COMPLEX TWOLEVEL command in Mplus (Asparouhov & Muthén, 2006; L. K. Muthén & Muthén, 1998–2010, p. 234). For this model, we used the TWOLEVEL command to model nonindependence within cohorts and the COMPLEX command to adjust standard errors for nonindependence within therapists. Mplus uses the Huber-White "sandwich" estimator to produce corrected standard errors. In effect, this represents a hybrid approach in which lower levels (families and cohorts) were explicitly included in the multilevel model, while a third level (therapists) was used only to adjust standard errors. This approach was feasible because there were no therapist-level predictors of TAM of substantive theoretical interest. Therapist experience was a family-level variable because each family was associated with a different level of therapist experience. Thus, we specified a two-level structural equation model to model families nested within cohorts (see Figure 1 for a visual representation of the two-level model used to evaluate predictors and outcomes of MST treatment adherence).

Examination of the intraclass correlation coefficients for TAM indicated that only 3% of the variance was attributable to the team to which the therapist belonged. However, the estimated design effect (DEFF = 4.3) suggested the need to account for nonindependence due to clustering within team (B. O. Muthén & Satorra, 1995). Therefore, the effect of team on TAM was held constant by specifying it as a fixed effect at the cohort level (level-2). Specifically, the random intercept of TAM was regressed onto a set of nine dummy-coded variables (scored 1 and 0) representing the 10 teams. Five additional clusters were created for five therapists who were cross-classified (i.e., members of two teams). The team with the largest number of participants served as the reference group for model testing, and dummy-coded variables were created for each of the other teams (scored 1). To enhance visual clarity, team is represented by a single box in Figure 1.

At the family level (level-1), model specification was the same as the modified family-level model just described. However, the model allowed the intercept for TAM to vary across cohort clusters. At the cohort level (level-2), the TAM intercept was an intercept-as-outcome predicted by team and years of team activity.

The TAM intercept represented the therapist’s overall TAM for all the families seen by that therapist in a single year of implementation. Continuous predictors of the TAM intercept were not centred because scores of zero on these variables (i.e., 0 years of team activity and 0 previous families treated) were conceptually meaningful. We used a robust FIML estimator for non-normal and dependent data (robust maximum likelihood) to evaluate model fit. Because chi-square-based indices of global model fit were not available for FIML analyses, we compared the hypothesized model to a feasible alternative model that tested for a cross-level interaction in which team and years of team activity predicted the random slope for the path predicting TAM from therapist experience (path d). We compared the models using the Bayesian Information Criterion (BIC) and the Akaike Information Criterion (AIC). When comparing models, lower BIC and AIC values indicate better relative model fit, and a BIC difference between the models of greater than 10 indicates very strong evidence against the model with the largest BIC (Raftery, 1995). Information criteria for the hypothesized model (AIC = 9499.78, BIC = 9626.67, sample size adjusted BIC = 9544.10), and alternative model (AIC = 9516.34, BIC = 9696.91, sample size adjusted BIC = 9579.40) indicated that the hypothesized model was the better fitting model and thus did not provide sufficient basis for including the cross-level interaction effects.

Predictors of Therapist Adherence

Table 2 presents the parameter estimates for family- and cohort-level paths specified in the model. At the family

level, findings indicated that therapist experience, youth gender, and TAM interview language were not statistically significant predictors of TAM. At the cohort level, years of team activity was a statistically significant predictor of the TAM intercept (path k), $B = 1.86$, $p < .001$, 95% CI [.81, 2.54]. For every year that a team had been active at the time a family began treatment, the therapist’s overall TAM rating for all families treated during the same year increased by 1.86, holding constant all other covariates.

Predictors of Posttreatment Youth Outcomes

FIML analyses used a logit link (B. O. Muthén, 1998–2004) to accommodate the binomial distributions of the dichotomized posttreatment youth outcomes (lived at home, engaged in school or work, and had exhibited criminal behaviour). Path coefficients for dichotomous outcomes are logistic regression coefficients. Findings indicated that TAM ratings had small but significant effects in the hypothesized direction on all three post-treatment youth outcomes. Specifically, higher TAM scores predicted increased odds that youth lived at home at the completion of treatment (path h), $OR = 1.04$, 95% CI [1.02, 1.06] and that youth were engaged in school or work at the completion of treatment (path i), $OR = 1.02$, 95% CI [1.01, 1.04], holding all other covariates constant. A 1-unit increase in TAM scores (i.e., a 1-point increase on any of the 19 questions included in the total score) was associated with a 4% increase in the odds that youth lived at home at the completion of treatment and a 2% increase in the odds that youth were engaged in school or work at the completion of treatment. Higher

TABLE 2
Parameter Estimates

<i>Outcome</i>	<i>Predictor</i>	<i>Estimate</i>	<i>95% CI</i>	<i>p Value</i>	<i>Standardized Effect</i>
Level-1 (Family)					
TAM	Therapist Experience (<i>d</i>)	-.01	[-.09, .07]	.75	-.01
	Male (<i>a</i>)	-.34	[-1.50, .83]	.57	-.04
	Swedish Language (<i>c</i>)	-1.22	[-3.01, .57]	.18	-.14
Home	TAM (<i>h</i>)	.04	[.02, .06]	.001	.18
	Therapist Experience (<i>e</i>)	.05	[.01, .09]	.008	.24
School/Work	TAM (<i>i</i>)	.02	[.01, .04]	.005	.12
	Therapist Experience (<i>f</i>)	-.002	[-.02, .02]	.86	-.01
New Arrests	TAM (<i>j</i>)	-.02	[-.04, -.001]	.04	-.10
	Therapist Experience (<i>g</i>)	-.01	[-.03, .01]	.27	-.05
	Male (<i>b</i>)	.90	[.53, 1.24]	<.001	.48
Level-2 (Cohort)					
TAM intercept	Years of Team Activity (<i>k</i>)	1.86	[.81, 2.54]	<.001	.66
	Implementation Wave	4.48	[2.67, 6.29]	<.001	1.04

Note: Parameter estimates were obtained using the robust maximum likelihood estimator. Estimates for posttreatment outcomes are logistic regression coefficients. Labels of hypothesized pathways are included in parentheses. Standardized effects for continuous predictors are path coefficients standardized with respect to both predictor and outcome. Standardized effects for dichotomous predictors are path coefficients standardized with respect to the outcome only.

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TAM scores also predicted decreased odds that youth had exhibited criminal behaviour at the completion of treatment (path j), $OR = .98$, 95% CI [.96, 1.00], holding all other covariates constant. A 1-unit increase in TAM scores was associated with a 2% decrease in the odds that youths had exhibited criminal behaviour at the completion of treatment. Figure 2 presents the probabilities of posttreatment youth outcomes given different levels of TAM.

Findings also indicated that higher levels of therapist experience predicted increased odds that youth lived at home at the completion of treatment (path e), $OR = 1.05$, 95% CI [1.01, 1.09]. A one-family increase in therapist's experience predicted a 5% increase in the odds that youth lived at home. Therapist experience did not have significant direct effects on whether youth were engaged in school or work or whether they had exhibited criminal behaviour.

Indirect (mediated) effects of years of team activity on posttreatment outcomes via TAM (i.e., years of team activity \rightarrow TAM \rightarrow outcomes) were identified with the joint significance test (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Because bootstrapped confidence intervals are not available in Mplus 6.0 with

multilevel models, confidence intervals for indirect effects were computed using the web utility provided by Selig and Preacher (2008) for implementing the Monte Carlo method of assessing mediation in the context of multilevel structural equation models (Bauer, Preacher, & Gil, 2006). As previously noted, both the path predicting the TAM intercept from years of team activity (path k) and the paths predicting posttreatment youth outcomes from total TAM scores (paths h, i, j) were statistically significant, providing evidence of mediation (MacKinnon et al., 2002). Indirect effects were small but statistically significant. Specifically, each additional year of team activity was associated with a 7% increase in the odds that youth lived at home at the completion of treatment (path k * path h) ($B = .07$, $p < .01$), 95% CI [.03, .12], $OR = 1.07$, 95% CI [1.03, 1.13]; a 4% increase in the odds that youth were engaged in school or work at the completion of treatment (path k * path i) ($B = .04$, $p < .05$), 95% CI [.01, .09], $OR = 1.04$, 95% CI [1.01, 1.09]; and a 4% decrease in the odds that youth had exhibited criminal behaviour at the completion of treatment (path k * path j) ($B = -.04$, $p < .05$), 95% CI [-.08, .00], $OR = .96$, 95% CI [.92, 1.00], holding all other covariates constant.

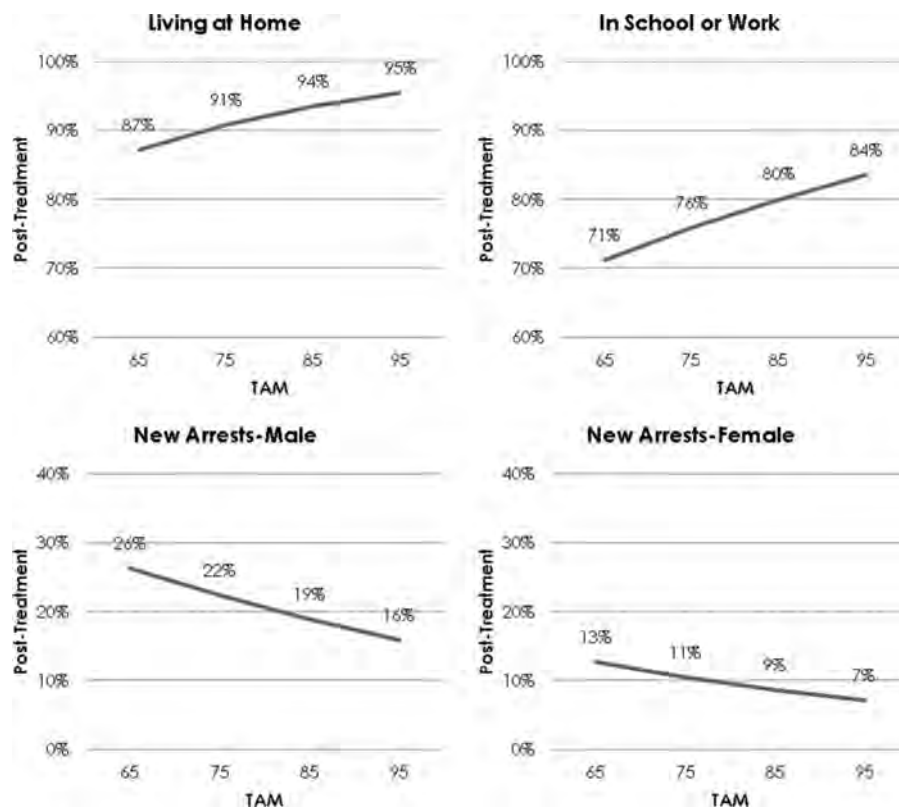


FIGURE 2 The probability of posttreatment computed for treatment adherence (TAM) at its mean, 1 standard deviation above and below its mean, and 2 standard deviations above and below its mean. *Note:* All probabilities were calculated with therapist experience with multisystemic therapy at its mean.

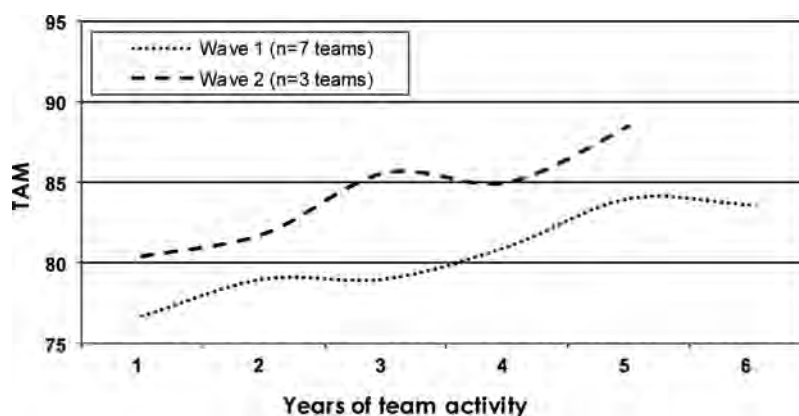


FIGURE 3 Averaged total treatment adherence (TAM) score by Years of Team Activity and Implementation waves.

Implementation Wave as a Predictor of TAM

Seven teams participated in the first wave of Swedish MST implementation, and three teams participated in the second implementation wave. A second two-level model was specified to evaluate whether implementation wave predicted TAM scores. The implementation wave model was the same as the model in the main analysis except that at the cohort level a single dummy-coded variable representing implementation wave (1 = Wave 2, 0 = Wave 1) replaced the set of dummy-coded variables representing each team. Examination of the information criteria for the implementation wave model suggested that, as with the model in the main analysis, the hypothesized model (AIC = 9515.13, BIC = 9602.98, 9602.98, sample size adjusted BIC = 9545.81) fit better than an alternative cross-level interaction model (AIC = 9519.58, BIC = 9622.07, sample size adjusted BIC = 9555.37). The path coefficients for effects of TAM on posttreatment youth outcomes (Figure 1, paths h, i, j) were identical to those reported for the main analysis.

Results indicated that implementation wave was a statistically significant predictor of the TAM intercept ($B = 4.48$, $p < .001$), 95% CI [2.67, 6.29]. Therapists on second implementation wave teams had overall yearly TAM ratings that were on average 4.48 points higher than the overall yearly TAM ratings of the therapists on first implementation wave teams, holding constant all other covariates. As seen in Figure 3, the second implementation wave therapists showed treatment adherence comparable to that of first implementation wave therapists in their 3rd year of experience. Indirect effects of implementation wave on posttreatment youth outcomes were also statistically significant. Specifically, Implementation Wave 2 was associated with 18% higher odds that youth lived at home at the completion of treatment ($B = .17$, $p < .01$), 95% CI [.07, .30], $OR = 1.18$, 95% CI [1.07, 1.35], and 11% higher odds

that youth were engaged in school or work at the completion of treatment ($B = .11$, $p < .05$), 95% CI [.03, .21], $OR = 1.11$, 95% CI [1.03, 1.23], holding constant all other covariates. Implementation Wave 2 was associated with 9% lower odds that youth had exhibited criminal behaviour at the completion of treatment ($B = -.09$, $p < .05$), 95% CI [-.20, -.01], $OR = .91$, 95% CI [.82, 1.00], holding constant all other covariates.

DISCUSSION

To our knowledge, this is the first study to present data on the links among treatment experience, treatment adherence, and treatment outcomes for an empirically supported youth intervention. The general pattern of findings was consistent with the hypothesis that treatment adherence predicts treatment outcomes. Specifically, higher levels of MST treatment adherence were statistically significantly associated with greater odds that at the completion of treatment youth lived at home, were engaged in school or work, and had not exhibited criminal behaviour. Although effect sizes were small, the finding that TAM scores predicted treatment outcomes was consistent with long-term follow-up data reported by caregivers and independent sources after youth completed MST (e.g., Schoenwald et al., 2008; Schoenwald et al., 2009; Schoenwald et al., 2003) as well as with the results of previous studies of ESIs other than MST (e.g., Barber et al., 2006; Sexton & Turner, 2010; Strunk, Brotman, & DeRubeis, 2010).

However, with respect to the relationship between MST treatment experience and MST treatment adherence, the analysis showed mixed results. Individual therapists' MST experience (as indicated by the number of completed therapies) did *not* predict MST treatment adherence, a finding that was consistent with previous MST research that has suggested that neither the

therapist's prior professional experience nor the therapist's individual experience with MST predict treatment adherence or other outcomes (Schoenwald et al., 2005). In contrast, increases in both team MST experience (as indicated by years of team activity) and organizational MST experience (as indicated by implementation wave) significantly predicted increases of therapists' adherence to MST treatment. These mixed findings raise questions about the relations among individual therapist experience, team experience, and organizational experience, and how they influence treatment adherence. Further research is needed to clarify these relations.

The ability to replicate effects shown in clinical trials when transferring behavioural interventions is complicated by many factors such as implementation with fidelity and adaptation of the intervention to other contexts and cultures (Fraser et al., 2009). The concept of implementation process describes how an intervention is put to work in clinical or practical settings, and the degree to which the interventions' goals, guidelines, and underlying theoretical principles are followed. Implementation is suggested to be a time-consuming multiphase process that includes several stages and components (Aarons, Hurlburt, & Horwitz, 2011; Chamberlain et al., 2008; Fixsen, Blase, Naom, & Wallace, 2009; Fixsen, Naom, Blase, Friedman, & Wallace, 2005). One goal of successful implementation is that ESI are adopted within real-world practice settings with high fidelity to the ESI's critical components (see Bond et al., 2001; Ganju, 2003; Moser et al., 2004; Mowbray et al., 2003).

Although few experimental studies have explored methods for improving treatment fidelity, the results reported thus far indicate that intensive and persistent training efforts with consistent feedback can successfully enhance treatment fidelity to ESI (Miller, Yahne, Moyers, Martinez, & Pirritano, 2004; Sholomskas et al., 2005). One interpretation of the results in this study is that there may also be cross-level interactions between the therapist's experience and team-level or organization-level characteristics. For instance, the individual therapist's experience may make a more distinctive contribution to treatment adherence once the team has achieved sufficient stability to foster a sense of collective efficacy (Bandura, 1997, 2002; Palinkas, Allred, & Landsverk, 2005; Patras & Klest, 2011).

The finding that both years of team activity and implementation wave predicted increases in therapists' MST treatment adherence corresponds well with previous research that has demonstrated that implementation is best considered a continuous process. This finding also suggests that treatment adherence is not just a function of the individual therapists' experience with the practice of MST. Indeed, second implementation

wave therapists showed treatment adherence comparable to that of first implementation wave therapists in their 3rd year of experience. These results are consistent with previous research that has highlighted the influence of interpersonal contacts within and between organizations and communities in the successful implementation of new interventions (Palinkas et al., 2005). The multilevel mediation findings extend this previous research by suggesting that team- and organization-level MST experience are indirectly linked to treatment outcomes. Although tentative, these findings suggest that experience at higher levels of the organization influences treatment outcomes through increased treatment adherence. For example, the early stages of the MST implementation process in Sweden were not without unforeseen challenges. These included the lack of experience in both giving time-limited and structured interventions and applying strictly defined inclusion criteria within the Swedish social welfare system (Sundell, Vinnerljung, Andrée Löfholm, & Humlesjö, 2007). This lack of experience cannot be attributed to only individual therapists; it was shared at the team and organization levels. However, this shared lack of experience may have affected implementation at the level of individual therapists. The lower TAM scores of therapists from the first implementation wave and, in turn, the lower odds of positive treatment outcomes may have been influenced by team- and organization-level factors. As MST experience increased over time, TAM scores and the odds of positive treatment outcomes increased.

Limitations

The results are based on retrospective data and thus are better viewed as hypothesis generating rather than hypothesis testing. As with many retrospective studies, this study lacked several potentially important measures. For instance, there are no data available on variables such as organizational climate and structure or on therapist characteristics such as level of training. However, one strength of this study is that the analysed data set includes the first families ever treated with MST in Sweden. Thus, although therapists and teams may have varied in experience of other interventions and their level of training, none of the therapists had previous experience providing MST.

With respect to the finding that TAM scores predicted treatment outcomes, it is important to note that TAM scores had small effects on these outcomes. This is likely due, at least in part, to the fact that negative treatment outcomes were rare events—the vast majority of youth lived at home, were engaged in school or work, and did not exhibit criminal behaviour. Thus it is possible to question the practical significance of this finding. However, given the serious behaviour problems

that triggered the referral to treatment and the risk of future antisocial behaviour that negative treatment outcomes entail, identifying *any* predictors of these outcomes is important. Documenting even a weak link between MST treatment adherence and treatment outcome potentially provides guidance for future research that pursues a more comprehensive assessment of treatment outcome.

This study also does not include data on family characteristics or the severity of the youths' problems at the start of therapy. Thus, detailed analyses on the representativeness of the study sample and on how such factors would affect treatment adherence and youth outcome were not possible. On the other hand, MST has a clearly stated inclusion criterion: All youth must exhibit severe behaviour problems. Indeed, all of the youths recruited to MST in Sweden between March 2004 and March 2005 met the diagnostic criteria for conduct disorder (Sundell et al., 2008). Furthermore, this study included all youths that began MST between March 2003 and August 2009. The final study sample consisted of 84% of these youths.

In general, the youths who were excluded from the analyses due to a complete lack or limited TAM data were more likely to have had their treatment prematurely terminated because of a failure to engage the family in the treatment. Premature termination in itself is not likely to bias the result seen for treatment adherence, as it is expected that premature termination would be associated with a lack of TAM data. However, the excluded youths were also more likely to have caregivers who had been interviewed for TAM in a language other than Swedish. Although not surprising, as language difficulties would hinder the ability to conduct the TAM interview as planned, this may suggest that some ethnic groups are underrepresented in this study. However, further analyses exploring the ethnicity of the youths cannot be conducted because the TAM interview language does not necessarily reflect the language or ethnicity of the families but may instead reflect the common language shared by the interviewee and the caregiver (e.g., English).

In addition, as previously noted, TAM scores were negatively skewed. That is, responses on the upper end of the TAM rating scale (indicating greater adherence) were more frequent than responses on the lower end of the scale. One interpretation of this finding is that therapists were, in general, highly adherent to the MST treatment protocol. However, a second interpretation cannot be ruled out: that the TAM scale fails to detect small but potentially important variation in treatment adherence. TAM was originally developed as a feedback tool as a part of the MST quality assurance program. The primary intention was not necessarily to capture minute variation in treatment adherence but

rather may have been to identify cases with unexpected low adherence. Therefore, further refinement to the TAM scale may be required increase the measure's sensitivity and enhance its utility as a research measure.

Finally, therapists' assessments of youth outcomes provide only a limited understanding of MST treatment outcomes. These dichotomized outcomes yield no information about the magnitude or severity of the behaviour. Future research should include a more comprehensive assessment of post treatment outcomes, including a pretest measurement for the assessment of intervention change.

Implications for Practice and Research

This study confirms previous research showing that treatment adherence is important in order to achieve expected treatment outcomes. The results also provide support that treatment adherence is a process that is extended over a long time. As a consequence, the implementation of a new ESI requires ongoing and systematic support for a considerable time, including measuring adherence to monitor fidelity to the ESI's critical components to achieve the targeted treatment effects. Because the findings suggest that therapists' adherence is related to the collective MST experience of the team members, rather than that of the individual therapist, teamwork seems to be effective in this context.

The result that treatment adherence increased over at least 5 years has important implications for research. An outcome evaluation that is initiated during early stages of implementation may result in a failure to find effect of the intervention, thus making it paramount to secure adequate treatment adherence before recruiting clients.

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