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Effects of Multidimensional Treatment Foster Care on Psychotic Symptoms in Girls:

RH = MTFC and Psychotic Symptoms

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Abstract

Objective—Neurodevelopmental theories of psychosis highlight the potential benefits of early intervention, prevention, and/or preemption. How early intervention should take place has not been established, nor if interventions based on social learning principles can have preemptive effects. The objective was to test if a comprehensive psychosocial intervention can significantly

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alter psychotic symptom trajectories during adolescence – a period of heightened risk for a wide range of psychopathology.

Method—This study was a randomized controlled trial (RCT) of Multidimensional Treatment Foster Care (MTFC) for delinquent adolescent girls. Assessment of psychotic symptoms took place at baseline and then 6, 12, 18, and 24 months post-baseline using a standardized self-report instrument (Brief Symptom Inventory). A second source of information about psychotic symptoms was obtained at baseline or 12 months, and again at 24 months using a structured diagnostic interview (the Diagnostic Interview Schedule for Children [DISC]).

Results—Significant benefits for MTFC over treatment-as-usual for psychosis symptoms were observed over a 24-month period. Findings were replicated across both measures. Effects were independent of substance use and initial symptom severity, and persisted beyond the initial intervention period.

Conclusion—Ameliorating non-clinical psychotic symptoms trajectories beginning in early adolescence via a multifaceted psychosocial intervention is possible. Developmental research on non-clinical psychotic symptoms and their prognostic value should be complemented by more psychosocial intervention research aimed at modifying these symptom trajectories early in their natural history.

Keywords

psychotic symptoms; RCT; MTFC; juvenile justice; girls

Introduction

Childhood psychotic symptoms have been considered relatively benign and of little prognostic value. However, over the last 10–15 years, several studies have shown that ‘non-clinical’ psychotic symptoms reported in late childhood and/or early- to mid-adolescence predict psychotic disorders in adulthood, with odds ratios as high as 16.^{1–3} Early-emerging psychotic symptoms share many of the same features observed in adult psychotic disorders including early environmental and social risks (e.g., childhood maltreatment, psychosocial adversity, obstetric complications); cognitive, linguistic, and psychomotor deficits; similar brain morphology and patterns of psychiatric comorbidity; shared genetic influences; and familiarity.^{4–10}

This raises the question of whether it is possible to treat very early emerging psychotic symptoms and thus prevent some of the negative consequences that these symptoms appear to foretell. This question is particularly salient when applied to psychosis specifically because pharmaceutical treatments for clinical psychosis have limited benefit and fail to ameliorate symptoms in up to 50% of sufferers.¹¹ This has motivated attempts to intervene earlier in the disease process, especially because the worst prognosis is associated with longer periods of untreated disease.^{12,13} For example, the ‘ultra-high-risk’ (UHR) concept is now well recognized in the psychosis field, describing non-diagnosed but unwell patients who are at incipient risk of developing overt psychosis.^{11,14} These patients have been shown to benefit from early, staged psychosocial interventions.¹⁵

Extending the rationale for UHR intervention, we posit that treating earlier, perhaps milder, expressions of psychosis may also reap benefits. A recent systematic review and meta-analysis showed positive effects, highlighting cognitive-behavioral therapy (CBT) augmented by family therapy as the most promising approach.¹⁶ However, the clinical trials included in this meta-analysis were restricted to patients seeking treatment, suggesting that non-trivial levels of disability were already present—a point in the disease process that is likely to have been preceded by a lengthy prodromal period of between three to six years.

One small case series demonstrated some benefits of individualized CBT among those with non-clinical psychotic symptoms;¹⁷ however, we are unaware of any randomized controlled trials (RCTs) of psychosocial interventions aimed at modifying the course of psychotic symptoms in adolescents who were not selected for psychosis symptoms. In the present study, we investigated the possibility that an existing RCT with multiple follow-up assessments post-intervention would reduce psychotic symptoms in a sample that was not selected for psychotic symptoms but who had elevated risk histories. The sample was comprised of delinquent girls with histories of significant abuse and neglect, two well-established risk factors for adult psychosis.^{18–21}

Multidimensional Treatment Foster Care (MTFC)

Reduction of psychotic symptoms among delinquent youth might occur via methods that effectively treat their behavioral problems, given that these problems tend to co-occur and share some etiological and maintaining factors.^{8,10,22–24} MTFC is an efficacious family-based intervention for delinquency that is based on social learning theory.²⁵ Youth in MTFC are placed in homes with foster parents trained to implement a behavioral reinforcement model. Youth attend public school and receive intensive support and intervention in settings that closely parallel normal life. Parents or other caregivers with whom youth live after treatment are also trained in effective parenting skills. Thus, MTFC aims to permanently change the contexts that support problem behaviors.

MTFC is an effective intervention for delinquency among girls.^{26,27} Specifically, girls receiving MTFC compared to those receiving community group care (GC) treatment-as-usual showed reduced delinquency (as indexed by rates of criminal referrals, days in locked settings, self-reported delinquency) at 24-month follow-up.²⁶ Furthermore, other beneficial MTFC effects persist beyond the intervention period, including decreased associations with deviant peers,²⁸ reduced rates of teenage pregnancy,²⁹ and reduced depression.³⁰

MTFC does not directly target psychotic symptoms. Still, such effects are plausible given some shared etiological features (e.g., abuse and neglect), and similar patterns of sequential comorbidity (i.e., diagnoses of juvenile conduct disorder/oppositional defiant disorder precede a range of adult psychiatric diagnoses, including schizophreniform disorder).³¹ This study sought to test whether MTFC has beneficial effects on adolescent psychotic symptoms. We hypothesized that girls randomly assigned to MTFC, compared to those assigned to a treatment-as-usual control condition, would show significantly greater declines in their trajectories of psychotic symptoms across adolescence.

Method

Participants

Girls ($N = 166$) participated in an RCT in one of two consecutively run cohorts ($n = 81$ and 85 for cohorts 1 and 2, respectively) conducted in the Northwestern United States between 1997 and 2006 to contrast MTFC and GC (i.e., services-as-usual). Participants had been court-mandated to community-based out-of-home care due to chronic delinquency. We attempted to enroll all referred girls ages 13–17 who had at least one criminal referral in the last 12 months, were placed in out-of-home care within 12 months after referral, and who were not pregnant at the time of recruitment. Girls provided assent, and their legal guardian provided consent to participate. The project coordinator randomly assigned girls to MTFC ($n = 81$) or GC ($n = 85$) using a coin toss. Examination of baseline characteristics (criminal referrals, alcohol, marijuana, and other illicit drug use, and demographic information including ethnicity, age, maltreatment history, single parent family, income parent criminality) indicated no significant differences between groups (all $p > .10$), suggesting the general success of the randomization process. After the baseline assessment, girls were placed in their randomized intervention setting. The mean length of stay in the randomized intervention setting was approximately 6 months and did not differ by condition. Clinical and assessment staff members were independent, and the latter were blind to intervention assignment at all timepoints. Assessment staff blinding could have been compromised during the post-baseline intervention period if girls were assessed in a treatment setting, although during this period some MTFC girls spent time in GC and some GC girls spent time in non-MTFC foster care. Intent to treat (ITT) analyses included the entire sample, regardless of time in assigned intervention setting.

Participating girls were 13–17 years old at baseline ($M = 15.30$, $SD = 1.17$); the sample self-identified as follows: 68.1% Caucasian, 1.8% African-American, 11.4% Hispanic, 0.6% Native American, and 0.6% Asian; 16.9% “multiracial” and 0.6% “other/unknown.” Prior 2-year follow-up studies of this sample²⁹ had to rely on caregiver or caseworker reports of girls’ race/ethnicity in many cases. The present percentages were updated with self-reports collected in early adulthood and thus differ slightly from manuscripts that went to press prior to 2013. At baseline, 63% of the girls lived with single-parent families and 54% lived in families earning less than \$10,000.

Girls were assessed regularly for 24–36 months post-baseline as part of the original RCTs. Analyses accommodated individual and cohort differences in assessment timing, as detailed below. Figure 1 depicts the CONSORT subject flow chart for the overall study; though sample sizes differed for some outcomes, our use of ITT and full information maximum likelihood in primary analyses makes use of data on the full sample. The original RCT and follow-up assessments were approved and regularly reviewed by the senior author’s institutional review board.

MTFC condition—Girls in MTFC were placed in one of 22 homes with state-certified foster parents trained to implement a behavioral reinforcement program (e.g., point-and-level system). Experienced program supervisors with small caseloads supervised all clinical staff, coordinated all aspects of each youth’s placement, and maintained daily contact with

foster parents to provide ongoing consultation, support, crisis intervention, and monitor treatment fidelity. Interventions were individualized but always included daily telephone contact with foster parents; weekly group supervision and support meetings for foster parents; an in-home, daily point-and-level program for girls; individual therapy for each girl; family therapy for the aftercare placement family focusing on parent management strategies; close monitoring of school attendance, performance, and homework completion; case management to coordinate the interventions in the foster family, peer, and school settings; and 24-hr on-call staff support for foster and biological parents. The individual therapy sessions focused on helping girls identify specific stressors, tracking the occurrence of symptoms, normalizing the presence of symptoms (given the trauma history), and role-playing coping responses. In cohort 2, MTFC also included components targeting substance use (e.g., motivational interviewing and incentives for clean urinalyses) and risky sexual behavior (e.g., information on behavior norms, and education and instruction about strategies for being sexually responsible). Otherwise, MTFC components were the same in cohorts 1 and 2.

Group care condition—Girls in GC were placed in intensive out-of-home care settings, with 24/7 care. These community-based group care programs represented community treatment as usual for girls being referred to out-of-home care by the juvenile justice system ($n = 35$ unique GC settings). Programs had 2–83 youths in residence ($M = 13$) and 1–85 staff members ($Mdn = 9$). Program philosophies were primarily behavioral (67%) or multi-perspective (33%); 80% of the programs reported delivering weekly therapeutic services. Sites either required on-grounds schooling (41%), sent only some girls to school off-grounds (38%), or sent all girls to off-grounds school (21%). Kerr et al.²⁹ provides further details.

Measures

Psychotic symptoms—We included two measures of psychotic symptoms; one measure was collected at 5 time points over the first 24 months post-baseline (the Brief Symptom Inventory [BSI]: Psychotic Subscale)³² and was used in growth modeling analyses, and one measure was collected twice over the first 24 months of the study and was examined as an outcome controlling for earlier symptoms (the Diagnostic Interview Schedule for Children-IV [DISC-IV]: psychotic symptoms.).³³

The BSI is the short form of the SCL-90R instrument, both of which have typically been used as objective methods of screening for psychological problems and measuring treatment progress. The psychosis subscale was computed as the mean of five items rated on a 5-point Likert-type scale from 1 (not at all) to 5 (very much). The five items assessed whether the participant felt in the last week that: (1) someone else was controlling her thoughts; (2) she was lonely even when with others; (3) she should be punished for her sins; (4) she never felt close to another person; and (5) something was wrong with her mind. Cronbach's alphas were .70, .68, .76, .71, and .80, respectively, over five waves (0–3 mo; 6 mo; 12-mo; 18-mo; 24-mo.). In our analysis, we used the *T*-score form of this measure. Clinical prevalence rates (*T*-score ≥ 63) were 18%, 10%, 6%, 4%, and 5% for the five waves, respectively.

The DISC-IV is a diagnostic interview that was designed to be administered by clinically untrained interviewers and covers diagnostic criteria from the *DSM-IV*, the *DSM-III-R*, and the *International Classification of Diseases, 10th Revision (ICD-10)*. Test-retest kappas range from .10 to .39; validity kappas range from .27 to .79. The DISC-IV was measured at baseline and 24 months for cohort I, and 12 and 24 months for cohort II. In our analysis, we used the count of the 22 psychotic symptoms at each DISC-IV assessment. Sample items include having visions, hearing things others didn't hear, believing people were plotting against you, and believing that others were stealing your thoughts. Forty-three percent of the sample endorsed at least 1 symptom at the first assessment and 24% endorsed at least 1 symptom in the second assessment.

Predictor variables—Intervention group assignment was coded 0 (GC) or 1 (MTFC). We also included several covariates in the models, including baseline marijuana use (rated on a Likert-type scale from 1 [never] to 5 [1 or more times/day]), age at baseline (calculated based on birth date and baseline assessment date), and ethnicity (coded as 1 [Caucasian] and 0 [other]).

Analysis Plan

The main study hypotheses were evaluated with growth curve modeling with the BSI symptom data using Mplus.³¹ Mplus makes use of maximum likelihood analysis, which can provide unbiased estimates in the presence of missing data. Maximum likelihood is considered to be one of the most robust methods for handling missing data and is superior to list-wise deletion, which can introduce bias.³⁵ In calculating the growth curve parameters for psychotic symptoms, we accounted for individual variations in assessment times (for example, the collection of the second or “6-month” wave ranged from 3 to 10 months after the baseline assessment, even though the target was 6 months). Mplus does not provide standard indices of fit or standardized coefficients for models where individuals have time-varying assessment points or count-based outcome variables, so none are reported.

We specified the time metric for estimating growth rates using each girl's person-specific assessment timeline. We initially fitted an unconditional model to evaluate the shape of the curve, then added intervention condition as a predictor of the growth curve slope. This model also controlled for baseline marijuana use, baseline age, and ethnicity. Separate intercept and slope factors were included, which allowed us to assess the intervention effects on slope independent of baseline (intercept) symptoms. In a second set of models, we estimated psychotic symptom counts with the DISC-IV at 24 months while controlling for earlier psychotic symptom count, baseline marijuana use, baseline age, and ethnicity. Since the outcome was count-based, we used Poisson regression in the DISC-IV models.

Results

Descriptive Statistics

Table 1 provides correlations and descriptive information using approximate assessment waves. There was a degree of missing data, but Little's Missing Completely At Random

(MCAR) test³⁶ was not significant ($\chi^2[76] = 71.15$, ns), which indicates that the missing data did not introduce bias into the analyses.

Unconditional Growth Curve

The unconditional growth curve for psychotic symptoms included a positive intercept (51.84, SE = .76, $p < .001$) and a negative slope (-3.46 , SE = .48, $p < .001$). The variance was significant for both intercept (60.99, SE = 12.61, $p < .001$) and slope (17.95, SE = 4.81, $p < .001$). The intercept and slope significantly and negatively covaried (coefficient = -19.54 , SE = 6.86, $p < .01$). The standardized correlation coefficient was calculated to be $-.59$.

MTFC Effects on Trajectories of Psychotic Symptoms (BSI)

Results of the analysis are presented in Table 2. MTFC resulted in a significantly steeper decline in psychotic symptoms when compared to the GC condition. The raw coefficient for MTFC (-2.05) suggested that *T*-scores on the BSI were reduced by more than 2 points per year for the MTFC condition as compared to the GC condition. Age, ethnicity, and marijuana use were not significant predictors. The curves for the two groups are presented in Figure 2.

MTFC Effects on Psychotic Symptoms (DISC-IV)

Results of the analysis are presented in Table 2. MTFC resulted in a significantly lower psychotic symptom count at 24 months when compared to the GC condition. The exponentiated regression coefficient suggested that MTFC girls reported roughly half the number of symptoms at 24 months as compared to GC girls, controlling for prior symptom counts (also a significant predictor). Age, ethnicity, and baseline marijuana use were not significant predictors.

Discussion

To our knowledge, this is the first report describing positive effects of an RCT on psychotic symptom trajectories among adolescents who were not selected for the presence of psychotic symptoms or via a psychosis high-risk approach. We observed significant benefits for MTFC over treatment-as-usual for psychosis symptoms that were independent of marijuana use and baseline severity and persisted beyond the intervention period. This follows publication of a small ($n = 4$) ‘proof of principle’ case series among children 9–14 years old demonstrating the efficacy of CBT for changing cognitive appraisals of psychotic-like experiences.¹⁷ Together, these findings raise hope that prevention and/or preemption of psychosis trajectories might be possible.³⁷

MTFC was designed to address conduct problems and is effective in this regard.^{26,27} It comprises a comprehensive, multifaceted intervention program addressing a variety of environmental risks (e.g., the home environment) and teaches a range of coping skills, with plentiful opportunity for real-world application. The present findings are consistent with, but importantly extend, a growing literature showing that CBT is an effective intervention for those with first-episode psychotic disorder or deemed to be at ultra-high-risk,^{38, 39} as well as

a recent review suggesting that CBT augmented by family therapy appeared to be the most promising approach for such at-risk patients.¹⁶ The findings are also consistent with a buffering effect of a positive family environment (indexed as higher levels of caregiver emotional involvement, positive remarks, and warmth), which predicted improvement in psychotic symptoms and social functioning among mainly adolescent patients.⁴⁰ The present data suggest that to the extent that MTFC addresses key precipitants and/or maintaining factors for psychotic symptoms,⁴¹ improvement can also be expected among those not specifically seeking treatment for psychotic symptoms, but who may have a broad range of risk factors, including maltreatment.

The positive impact on psychotic symptom trajectories seen in the MTFC condition is likely due to both direct and indirect mechanisms.⁴² That is, beyond the direct effects on psychotic symptoms via, for example, reduced aversive expressed emotion in the home environment,^{43, 44} indirect effects may have operated via reduction in both delinquent and depressive symptoms.^{26,27,30} This is because both these disorders index reactivity to stress to some degree, and such reactivity can often lead to further stressors⁴⁵ and/or unhelpful cognitive distortions.⁴⁶ Thus, amelioration of these symptoms may have reduced the cumulative stress burden experienced by these young women, which in turn might explain their more marked decrease in psychotic symptoms over the 24-month period. This would also be consistent with the posited affective pathway to psychosis – one which underlines the potential importance of stressful family processes.^{46, 47} It also aligns with more recent data demonstrating a dynamic process of symptom reduction among adolescents reporting psychotic symptoms via cessation of trauma.²³

Before considering the implications of these findings, we acknowledge the potential limitations of our study. Our sample was all-female, thus it is unknown whether the present findings also apply to males in similar circumstances. While it is known the men have early onset of psychotic disorder and slightly higher rates of schizophrenia during adulthood, our focus on adolescent girls may actually have been an advantage given recent data indicating higher base rates for psychotic symptoms reported by females at this age,⁴⁸ as well as the over-representation of females in the highest risk trajectories for psychotic symptoms during adolescence.⁴⁹ However, it is important to note that the majority of girls in this study showed subclinical levels of psychotic symptoms, even pre-treatment. A second limitation is that our psychotic symptom measures focused largely on positive symptoms, whereas negative symptoms and cognitive symptoms tend to be associated with worse long-term outcomes.^{50,51} Future studies should aim to measure all symptom types. However, these limitations should be viewed in the context of some notable strengths including the multiple, repeated measures of psychotic symptoms obtained via two methods (BSI, DISC-IV), the application of a high-quality MTFC intervention combined with a robust treatment-as-usual control group, and a comparatively high retention rate among this challenging adolescent group.

Mindful of these caveats, we believe our findings have implications for theory, research, clinical practice, and policy. With regard to theory and research, the neurodevelopmental theory of schizophrenia^{50,52,53} highlights the potential for, and value of, prevention efforts, and even the possibility of preemption.³⁷ Until now, intervention work in this area has

focused almost exclusively on preventing the transition into frank psychosis among those deemed at high or ultra-high risk.¹¹ However, current interest in the predictive value of early psychotic experiences has begun to focus on the issue of specificity, with recent data indicating that psychotic symptoms may actually predict a wide range of psychopathology (i.e., not just psychosis), multiple co-occurring diagnoses, poorer social functioning in adulthood, and a massively increased risk for suicide attempts.^{6,23,54,55} For example, Fisher et al.⁵⁵ reported from a prospective-longitudinal study that > 90% of those defined as having ‘strong’ psychotic symptoms at age 11 recorded at least one adult psychiatric diagnosis by age 38. Kelleher et al.²³ found that adolescents with psychopathology who reported psychotic symptoms had nearly 70-fold increased odds of acute suicide attempt. As a result of these and other studies, interest in early psychotic experiences and their long-term sequelae has broadened to focus on the value of early psychotic symptoms as a harbinger of future poor psychiatric health more generally,^{55–57} as well as understanding homotypic (dis)continuities, as exemplified in the psychosis-proneness-persistence-impairment model of psychotic disorder.⁵⁸ Our findings point to the value of complementing this important developmental research with greater investment in interventional prevention and preemption research.

With regard to clinical practice, treatments based on social learning principles have been found to work for psychosis,³⁸ albeit with effect sizes varying with the rigor of the study. In contrast, the mainstay pharmacological treatments tend to have their greatest impact on positive symptoms, albeit with limited benefit for approximately half of these patients, and they are not effective in modifying negative psychotic symptoms such as apathy or anhedonia, nor do they improve cognitive symptoms (e.g., short-term memory problems, poor cognitive control), which together predict much of the later disability and poor social functioning seen in psychosis. Critically, psychosocial treatments can and do ameliorate these deficits.⁵⁹

Implications for service-delivery policy are a hot topic of discussion and debate.⁶⁰ Clearly, comprehensive psychosocial interventions delivered very early in the putative disease process could work to mitigate negative psychosis symptom trajectories and potentially avoid a lot of suffering for individuals and reduce considerable overall societal burden. Our results resonate with other calls for removal of multiple barriers to the routine application of psychosocial treatments for those suffering with psychosis,⁶¹ and the current data argue for going one step further to consider the potential benefits of comprehensive psychosocial approaches for very early-stage prevention and/or preemption.

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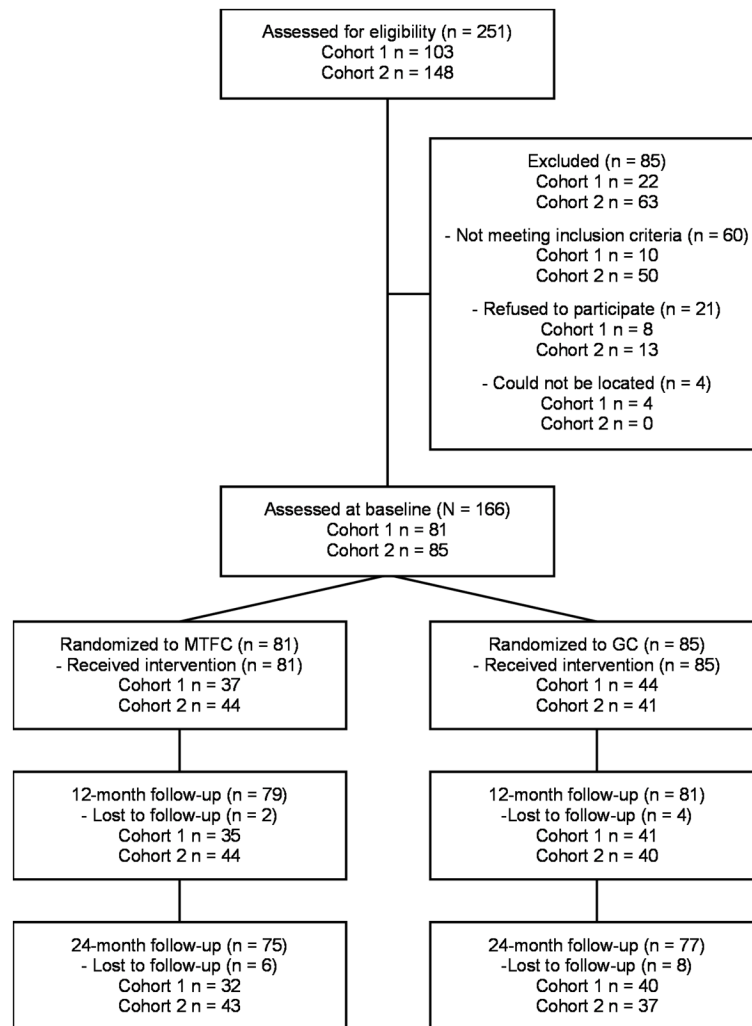


Figure 1. Consolidated Standards of Reporting Trials (CONSORT) diagram of participant flow in the overall study through study recruitment, randomization to Multidimensional Treatment Foster Care (MTFC) or group care (GC), and follow-up for participants in cohorts 1 and 2.

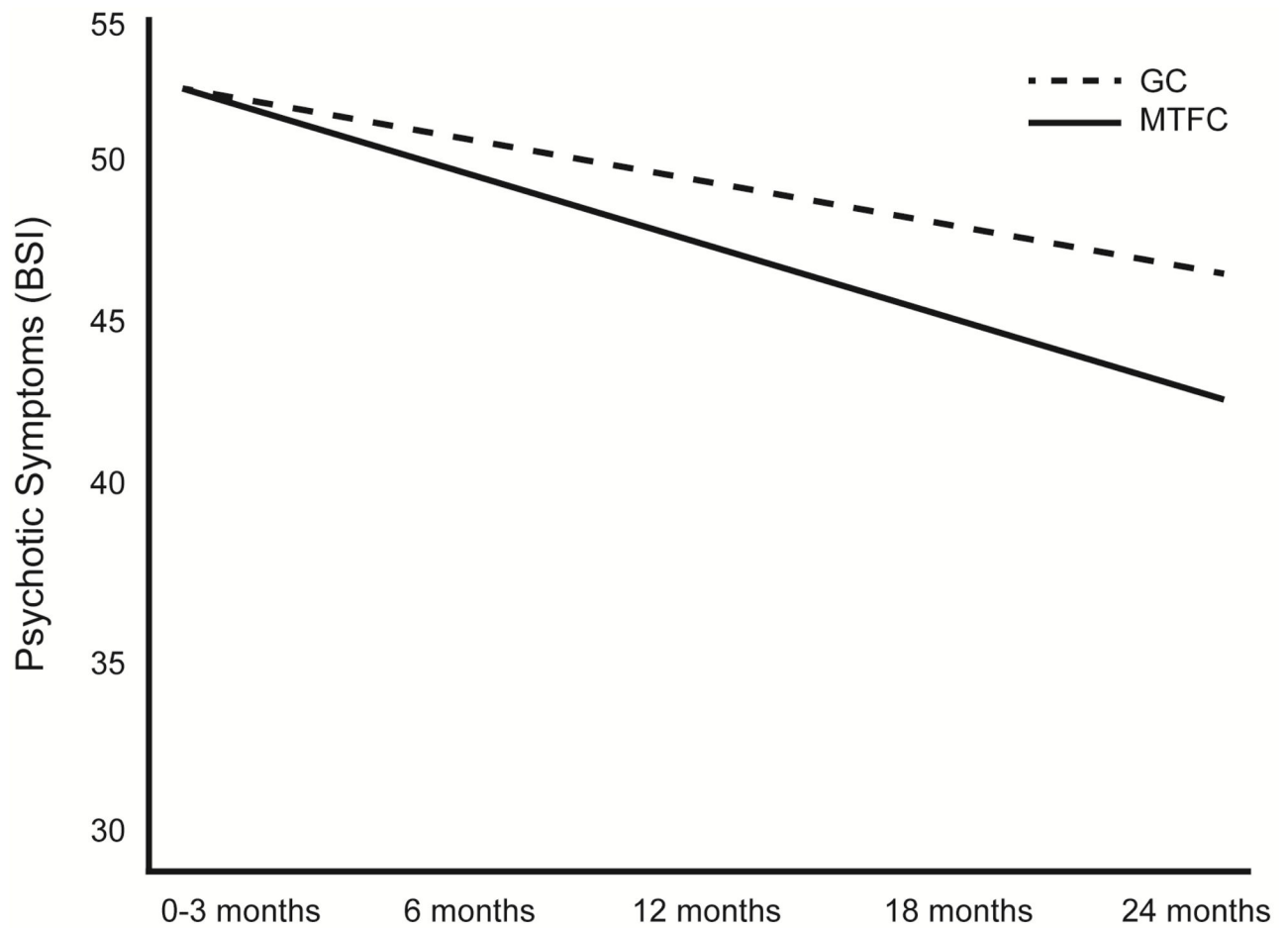


Figure 2.

Psychotic symptoms (Brief Symptom Inventory [BSI]) by group according to the growth curve analysis (see Table 2). Note: The graph assumes individuals with average (group mean) assessment intervals. GC = Group Care; MTFC = Multidimensional Treatment Foster Care.

Table 1

Means, Standard Deviations, and Intercorrelations of Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. MTFC condition	-										
2. Baseline marijuana use	-.08	-									
3. Baseline age	.01	-.05	-								
4. Ethnicity	.07	-.01	-.08	-							
5. BSI Psychotic symptoms (0-3 mo)	.19*	.07	-.05	.11	-						
6. BSI Psychotic symptoms (6 mo)	.04	-.01	-.03	-.01	.53***	-					
7. BSI Psychotic symptoms (12 mo)	-.03	-.08	-.05	.03	.30***	.46***	-				
8. BSI Psychotic symptoms (18 mo)	.05	-.08	-.10	-.12	.33***	.34***	.50***	-			
9. BSI Psychotic symptoms (24 mo)	-.08	-.03	-.03	-.05	.21*	.38***	.35***	.56***	-		
10. DISC Psychotic symptoms (0-12 mo)	-.15	.12	-.01	-.19*	.04	.25**	.25**	.31***	.18*	-	
11. DISC Psychotic symptoms (24 mo)	-.12	.02	-.06	.08	.10	.20*	.28**	.27**	.24**	.37***	-
<i>M (Med)</i>	.49	2.97	15.30	.68	52.31	49.78	47.60	46.29	45.21	.00	.00
<i>SD (Range)</i>	.50	1.36	1.17	.47	10.41	10.14	10.19	9.34	9.81	3.00	2.00
<i>n</i>	166	163	166	166	160	158	140	139	132	158	133

Note. The Diagnostic Interview Schedule for Children (DISC) measure was count-based, so we report (a) Spearman's correlation instead of Pearson's correlation; and (c) range instead of standard deviation. BSI = Brief Symptom Inventory; MTFC = Multidimensional Treatment Foster Care.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Unstandardized Model Coefficients for the Growth Curve and Poisson Regression Models

	Growth Curve (BSI)	Poisson Regression (DISC)	e ^{Coefficient}
	Coefficient (SE)	Coefficient (SE)	
MTFC	-2.05* (.93)	-.65** (.22)	.52
Baseline marijuana use	-.42 (.37)	-.42 (.37)	ns
Baseline age	.19 (.45)	.14 (.10)	ns
Ethnicity	-1.95 (1.08)	.30 (.23)	ns
Prior symptoms	-	.19*** (.03)	1.21

Note. BSI = Brief Symptom Inventory; DISC = Diagnostic Interview Schedule for Children; MTFC = Multidimensional Treatment Foster Care; ns = not significant.

*
p < .05;

**
p < .01;

p < .001.