Mentalization-Based Treatment for Self-Harm in Adolescents: A Randomized Controlled Trial

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Objective: We examined whether mentalization-based treatment for adolescents (MBT-A) is more effective than treatment as usual (TAU) for adolescents who self-harm. **Method:** A total of 80 adolescents (85% female) consecutively presenting to mental health services with self-harm and comorbid depression were randomly allocated to either MBT-A or TAU. Adolescents were assessed for self-harm, risk-taking and mood at baseline and at 3-monthly intervals until 12 months. Their attachment style, mentalization ability and borderline personality disorder (BPD) features were also assessed at baseline and at the end of the 12-month treatment. **Results:** MBT-A was more effective than TAU in reducing self-harm and depression. This superiority was explained by improved mentalization and reduced attachment avoidance and reflected improvement in emergent BPD symptoms and traits. **Conclusions:** MBT-A may be an effective intervention to reduce self-harm in adolescents. **Clinical trial registration information**—The emergence of personality disorder traits in adolescents who deliberately self harm and the potential for using a mentalisation based treatment approach as an early intervention for such individuals: a randomised controlled trial; http://www.controlled-trials.com; ISRCTN95266816. J. Am. Acad. Child Adolesc. Psychiatry; 2012; 51(12):1304-1313. **Key Words:** self-harm, treatment, borderline, RCT.

Self-harm can be defined as any act of deliberate harm to oneself, regardless of whether it is accompanied by suicidal thoughts.[1] It is common in community samples,[2] and the incidence of self-harm without suicidal intent is increasing.[3] Self-harm in clinical groups is associated with negative outcomes.[1] Self-harm is common among young people with treatment-resistant depression, and is a significant predictor of future suicide.[4] In a population-based US sample, the prevalence of self-harm in youths was 17%.[5] Of young people with self-harm behaviors, 30% continue to harm themselves into adulthood.[6] When adolescents present with self-harm and depression, the close association of self-harm with suicide is of particular clinical concern.[1,4]

There are few evidence-based treatments for adolescents who harm themselves.[7] A promising group program evaluated in a small randomized clinical trial (RCT) showed a reduction of self-harming behavior in adolescents over 12 months of treatment compared to with treatment as usual (TAU) (either family work or supportive therapy).[8] However, two large-scale replications failed to demonstrate benefit.[9,10] In their study of multisystemic therapy, Huey et al[11] reported that multisystemic therapy, conducted over 6 months, appeared to be more effective than hospitalization on a single-item measure of suicidality but no more effective than TAU in reducing suicidal ideation, depression, or hopelessness. An RCT of cognitive analytic therapy for adolescents with borderline personality disorder (BPD), 91% of whom presented with self-harm,[12] found that cognitive analytic therapy was no more effective than TAU in reducing self-harm, depression, and changes in BPD symptoms. Two open trials with dialectical behavior therapy (DBT) reported

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that DBT yielded no additional reduction in self-harm when added to inpatient treatment[13] or when delivered on an outpatient basis in comparison to psychodynamic psychotherapy.[14] Brief solution-focused family intervention failed to reduce self-harm or depression.[15] Treatment trials for depressed adolescents (including self-harming and non–self-harming adolescents) have shown limited effectiveness in reducing self-harm.[1,16,17] This pattern of null results was confirmed by a narrative review[7] and a meta-analysis using engagement in treatment as primary outcome,[18] which found no difference between specifically developed therapies and TAU. These findings are disappointing, particularly given the modest but significant benefits associated with manualized psychotherapy for adolescents with major depression.[19]

We drew on our work with patients with severe BPD to develop an alternative conceptual and clinical strategy for self-harm in depressed adolescents. Two RCTs have shown mentalization-based treatment (MBT) to be effective in reducing self-harm in adult patients.[20,21] Mentalization is the capacity to understand actions in terms of thoughts and feelings. Its enhancement is assumed to strengthen agency and self-control in those with affect dysregulation and impulse control problems.[22] We have suggested that self-harm in adolescents occurs in response to relationship stress, when the individual fails to represent the social experience in terms of mental states.[23] When mentalizing is compromised, self-related negative cognitions are experienced with great intensity, leading to both intense depression and an urgent need for distraction. Furthermore, when non-mentalizing engenders social isolation, engaging in manipulative behavior and self-harm may aid reconnection.[24] When mentalization of social experience fails, impulsive (poorly regulated) behaviors and subjective states triggering self-harm become prominent. (For more information on the theoretical assumptions associated with this intervention, please refer to Supplement 1, available online.)

Given the limited success of self-harm–focused psychological interventions, we tested whether a modification of this intervention, mentalization-based treatment for adolescents (MBT-A), would reduce self-harm in adolescents. We designed and manualized a 12-month intervention program that included both individual[25] and family[26] therapy.

METHOD

Study Design

The study was a pragmatic small-scale randomized, superiority trial comparing MBT-A with TAU for adolescents with self-harm (inclusive of suicidality). Allocation was by minimization, controlling for past hospital admissions, gender, and age. The treatment period per case was 1 year, with measurement at 3, 6, 9, and 12 months postrandomization. The primary outcome measure was self-harm in the previous 3 months. Secondary outcomes included symptoms of BPD, risk taking, and depression. Assessors and participants were both blinded to assignment. There was no difference in the information given to the groups during the consent process.

Entry Criteria

The RCT took place in northeastern London (population ~1 million). We recruited from consecutive case individuals presenting with self-harm to community mental health services or acute hospital emergency rooms. After an emergency assessment conducted by the on-call clinician, all case individuals who did not require inpatient treatment were invited to participate. Those who agreed were contacted by a research assistant who provided them with verbal and written information and obtained written consent from both youths and parents. Eligible participants were those 12 through 17 years of age who presented with at least one episode of confirmed self-harm within the past month, and for whom self-harm was the primary reason for referral and was confirmed as intentional. For our purposes, self-harm was defined as any intentionally self-inflicted injury (including poisoning) irrespective of the apparent purpose of the behavior (however, if poisoning appeared to be the result of excessive use of recreational drugs, the episode was not considered eligible). Individuals with a comorbid diagnosis of psychosis, severe learning disability (IQ < 65), pervasive developmental disorder, or eating disorder in the absence of self-harm were excluded. Concurrent substance misuse was not an exclusion criterion, but chemical dependence was.

Structure of Treatment Programs

MBT-A. The MBT-A program is a year-long, manualized, psychodynamic psychotherapy program with roots in attachment theory (a copy of the manual is available from the first author on request). It involves weekly individual MBT-A sessions and monthly mentalization-based family therapy (MBT-F) with a focus on impulsivity and affect regulation (a more detailed explanation of MBT-A is provided in the Supplement 1, available online). The program aims to enhance patients' capacity to represent their own and others' feelings accurately in emotionally challenging

situations. Individual and family sessions both lasted 50 minutes and all sessions were audiotaped.

Twenty-two child and adolescent mental health workers from different professional backgrounds received 6 days' training in MBT-A and MBT-F delivered by the authors. Additional training was provided through weekly group supervision, facilitated by the first author. Participants who were severely depressed were likely to be offered antidepressants.

TAU. Routine care was provided by community-based adolescent mental health services. All TAU treatments were delivered by fully qualified child mental health professionals. TAU was not manualized but was delivered based on UK National Institute for Health and Clinical Excellence guidance[27] that prescribes evidence-based interventions according to diagnostic criteria. There was no statistically significant difference in the modality (individual, family, psychiatric, or other) or duration of the treatments between the groups (further information on treatment modalities is provided in the Table S1, available online). The majority of case participants in the TAU group received the following: an individual therapeutic intervention alone (28%), consisting of counseling (in 38% of cases receiving an individual intervention), generic supportive interventions (24%), cognitive behavioral therapy (19%) or psychodynamic psychotherapy (19%); a combination of individual therapy and family work (25%); or psychiatric review alone (27.5%).

Randomization

When their assessments were complete, eligible consenting participants were randomized by an independent statistician working off-site using an adaptive minimization algorithm. Allocations were sent in separate envelopes to an administrator who informed the relevant clinicians (further information on randomization is provided in Supplement 1, available online). Patients were not told which arm of the trial they were in. Allocation was also successfully concealed from the outcome assessors.

Measures

The primary outcome was self-harm assessed by self-report at baseline and every 3 months until 12 months after randomization, using the self-harm scale of the Risk-Taking and Self-Harm Inventory (RTSHI), a 38-item self-report measure (see Supplement 1, available online, for further description and psychometric properties of the measure used).[28] Self-reported self-harm was confirmed by an interview at baseline and at 12 months, using the Childhood Interview for *DSM-IV* Borderline Personality Disorder (CI-BPD),[29] a semi-structured interview developed to assess BPD in latency-aged children and adolescents.

Secondary outcomes included depression measured every 3 months by the 13-item Mood and Feelings Questionnaire (MFQ),[30] risk-taking measured using the risk-taking scale of the RTSHI, and emerging BPD. Borderline diagnoses were based on the CI-BPD.[29] A continuous measure of borderline features based on self-report was provided by the Borderline Personality Features Scale for Children (BPFS-C).[31] Interviews were conducted at baseline and at 12 months.

Two measures related to hypothesized mechanisms of change were also administered before and after treatment. Mentalization was assessed using the How I Feel (HIF) questionnaire (unpublished data, 2008). Attachment status was assessed using the Experience of Close Relationships Inventory (ECR).[32]

Ethical Approval and Trial Registration Number

The study was approved by the NELFT Institutional Review Board, REC 3, and the trial was registered with the International Standard Randomized Controlled Trial Number Register (ISRCTN95266816).

Sample Size

A total of 80 participants were recruited. The sample size calculation was motivated by observed success rates of this approach with adult samples[20] and the degree of change that would be considered clinically significant (Supplement 1, available online, for further discussion of sample size).
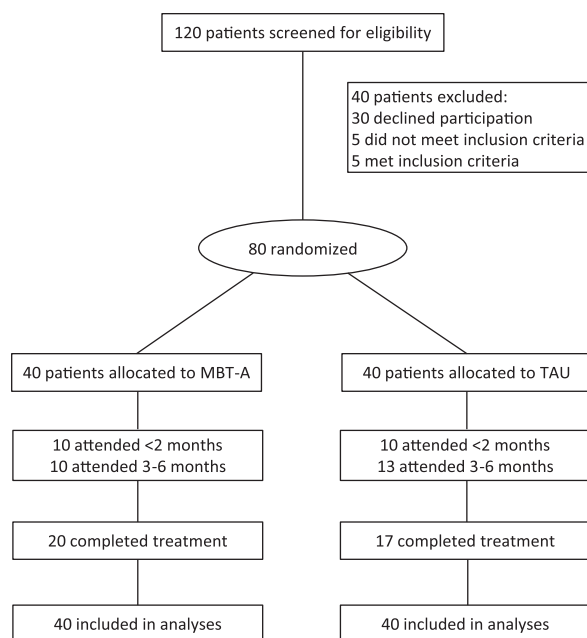
Participant Adherence

Patient flow through the trial is presented in Figure 1. All participants randomized were included in the statistical analysis.

Statistical Analysis

All analyses were carried out using Stata Statistical Software Release 12.[33] Data analysis was by intention to treat. Missing values were not a great a problem, with observations available for 92% of primary and ~85% (90–65%) of secondary outcome or mediator variables. Treatment differences and changes over time were analyzed by using the XTMIXED procedure for the continuous variables, including RTSHI, MFQ, and BPFS-C scores, and by using XTMELOGIT for the presence of self-harm behavior. RTSHI scores were highly positively skewed, and a log transformation was applied to all scores. The five time points were coded as -4, -3, -2, -1, and 0 in all models for which 3-monthly data were available, thereby implying that regression coefficients involving time measured the linear rate of change from baseline to 12-month follow-up and that regression intercepts referenced group differences at the last follow-up point. There was evidence of strong non-linear change effects in both the MBT-A and TAU groups in preliminary models; therefore a quadratic time variable was included in all

FIGURE 1 Consort diagram for the mentalization-based treatment for self-harm in adolescents (MBT-A) self-harm trial. Note: TAU = treatment as usual.

RESULTS

Sample

Sample characteristics are shown in Table 1. The mean age of participants was 14.7 years, and 85% of the sample was female. Although the TAU group was slightly younger in age, there was no difference between the groups in term of pubertal staging. In all, 75% of the sample were white, 10% were Asian, 5% black, 7.5% mixed race, and 2.5% "other." Approximately half of the sample had started self-harming 5 months previously or more recently. There was a high level of mental disorder: 97% met criteria for depression and 73% for BPD. Of the participants, 28% reported substance misuse and 44% reported alcohol problems. A slightly higher proportion of the TAU group (53%) than the MBT-A group (30%) had a prior history of involvement with mental health services but the difference was not statistically significant.

Details of Self-Harm

Participants presented with a variety of self-harm methods: 95% had a history of cutting or were currently cutting, 64% had taken an overdose at least once, and 80% reported attempting suicide either in the index episode or in the past.

Treatment Received

Overall, the number of hours of clinical attention received by the two groups did not differ (mean$_{TAU}$ = 17.3, SD = 14.6; mean$_{MBT}$ = 20.3, SD = 17.7; z = 0.55, NS). The mean number of appointments attended declined significantly from 6.3 in the first quarter to 3.3 in the last 3 months of the trial, when modeled with a mixed-effects model with time and group as fixed effects (β = –0.61, 95% CI = –0.94 to –0.28, z = 3.61, p = .0001), but rate of decline did not significantly differentiate the groups (β = –0.4, 95% CI = –0.87 to 0.06, z = 1.68, p = .093). Most of the patients who discontinued treatment continued with the research. There was no difference between the percentage of patients completing 12 months of treatment in the two arms of the trial (50% MBT-A, 43% TAU). Significantly fewer participants in the TAU group (33%) than in the MBT-A group (63%) received family-based intervention (χ^2[1] = 7.2, p = .003). In the MBT-A group, no family sessions were attended in one-third of cases; this was mostly linked to the family's refusal to participate in the young person's treatment, and in a few cases the young person did not wish the family to

models but was removed if the likelihood ratio test yielded non-significant indication of improvement in fit. A linear random intercept model best fitted the pre-/post-treatment measures, whereas the RTSHI and MFQ outcomes were best represented by a linear random intercepts and slopes model. Diagnosis of BPD features using the CI-BPD was best fitted by a logistic proportional odds random intercepts model. Effects for all outcome measures were adjusted by additionally incorporating into all fitted models covariates for age, as the TAU group was slightly but statistically significantly younger, despite adaptive minimization of random assignment.

Only those primary model parameters that are directly relevant to the study objectives are presented here. These are as follows: the overall significance of the model (Wald χ^2 statistic); group differences at 12 months (indicating whether MBT-A was better or worse than TAU at the 12-month time point); the linear rate of change from baseline to 12 months for both groups combined (indicating the extent to which adolescents improved or deteriorated over the year of the study); and the differential rate of change for the MBT-A group (indicating whether the rate of improvement or deterioration in this group was substantially stronger than in the TAU group).

All model parameters for continuous outcome measures are presented here as partial standardized effects, whereas those for the categorical measures of BPD diagnosis are presented as conditional odds ratios. Complete tables of all modeling results are available upon request from the authors.

TABLE 1 Characteristics of the Sample

Characteristics at baseline	TAU	MBT-A	Test Statistic	p
Female, n/N (%)	35/40 (87.5)	33/40 (82.5)	$\chi^2(1) < 1$	NS
Age, years, mean (SD)	14.8 (1.2)	15.4 (1.3)	$t(78) = 2.01$	.04
Pubertal status, advanced pubertal, n/N	27/38 (71)	22/39 (56)	$\chi^2(1) = 1.78$	NS
Black and ethnic minority n/N (%)	10/40 (25)	10/40 (25)	$\chi^2(1) < 1$	NS
Verbal ability, Mill Hill score, mean (SD)	42.1 (10.2)	41.9 (12.2)	$t(78) < 1$	NS
Non-verbal ability, Raven's Matrices, mean (SD)	41.4 (9.0)	42.5 (9.2)	$t(77) < 1$	NS
Started self-harming			$\chi^2(1) < 1$	NS
<3 Months ago	16/40 (40)	16/40 (40)		
3–5 Months ago	4/40 (10)	7/40 (17.5)		
6–11 Months ago	6/40 (15)	2/40 (5)		
1–2 Years ago	11/40 (27.5)	12/40 (30)		
>2 Years ago	3/40 (7.5)	3/40 (7.5)		
Prior history of mental health service use	20/40 (50)	12/40 (30)	$\chi^2(1) = 3.33$	.07
Incident(s) of medication overdose, n/N (%)	26/40 (65)	25/40 (64)	$\chi^2(1) < 1$	NS
Incident(s) of deliberate self-cutting, n/N (%)	39/40 (98)	37/40 (93)	$\chi^2(1) < 1$	NS
Living with two parents, n/N (%)	15/40 (38)	17/40 (43)	$\chi^2(1) < 1$	NS
Not enrolled in formal education, n/N (%)	2/40 (5)	0/40 (0)	$\chi^2(1) < 1$	NS
Alcohol problems, n/N (%)	15/40 (38)	20/40 (50)	$\chi^2(1) = 1.27$	NS
Substance misuse, n/N (%)	9/40 (23)	13/40 (33)	$\chi^2(1) = 1.00$	NS
Depression (MFQ≥8), n/N (%)	38/40 (95)	39/40 (98)	$\chi^2(1) < 1$	NS
BPD (CI-BPD ≥5)	28/40 (70)	30/40 (75)	$\chi^2(1) < 1$	NS

Note: BPD = borderline personality disorder; CI-BPD = Childhood Interview for DSM-IV Borderline Personality Disorder; MBT-A = mentalization-based treatment for adolescents; MFQ = Moods and Feelings Questionnaire; TAU = treatment as usual.

be involved. The number of psychiatric review sessions did not differ significantly between groups (t[78] = 1.69, p = .10).

Primary and Secondary Outcomes

Observed means and standard deviations for all four measurement points are presented in Tables 2 and 3 for the continuous and categorical primary outcome measures. Table 4 contains outcome and mediator variables, which were assessed at only two time points.

Self-Harm and Risk. Both groups showed significant reductions in both self-harm and risk-taking behavior following both a linear and a quadratic pattern. The interaction term for group × time was also significant for both variables, indicating that the linear decrease in RTSHI scores was significantly greater for the MBT-A group on both variables. At the 12-month point, self-harm scores were significantly lower for the MBT-A group. There was no difference in risk taking at 12 months. However, the MBT-A group reported significantly more risk-taking at baseline (t = 2.1, df = 78, p < .03), which accounted for differential linear effects. When the first observation of risk was entered into the model as a covariate, the differential linear change between the groups indicated marginally significant effects (group differential rate of change: β = –0.098, 95% CI = –1.34 to –0.71, t[159] = –1.79, p < .073, d = 0.28). Categorical assessment of self-harm reflected a similar pattern, although the quadratic time predictor was excluded from the mixed-effect logistic regression model as it prevented convergence. The odds of reporting at least one incident of self-harm in the past 3 months was reduced only for the MBT-A group and reflected a significant difference at 12 months (56% versus 83%, χ^2[1] = 5.0, p = .01, NNT = 3.66, 95% CI = 2.19 to 17.32). Interview data on self-harm confirmed the self-report result. In the TAU group 68% of participants were rated as definitely self-harming by the blinded assessor, compared with only 43% of the MBT-A group (Fisher's exact test, p < .05).

Depression. The level of self-rated depression decreased for participants in both groups following both quadratic and linear paths. The linear rate of decrease was somewhat greater for the MBT-A group (p < .04) and the model yielded a significant difference at 12 months. The mean difference was greatest at 9 months. The difference between the two groups appeared to decrease toward the end of treatment in line with expectations associated with the impact of termination of a

TABLE 2 Continuous Measures and Coefficients of Slopes Derived From Mixed-Effects Random Regression Models

| Continuous measure | Self-Harm (RTSHI) Log Mean (SE) | | Risk Taking (RTSHI) Log Mean (SE) | | Depression (MFQ) Mean (SE) | |
	TAU (n = 40)	MBT-A (n = 40)	TAU (n = 40)	MBT-A (n = 40)	TAU (n = 40)	MBT-A (n = 40)
Baseline	3.08 (0.10)	3.12 (0.09)	1.92 (0.14)	2.29 (0.11)	16.32 (0.74)	17.46 (0.843)
3 Months	2.19 (0.18)	2.02 (0.19)	1.45 (0.17)	1.69 (0.15)	12.89 (1.01)	12.11 (1.22)
6 Months	2.21 (0.20)	1.98 (0.17)	1.59 (0.14)	1.67 (0.14)	12.79 (1.15)	12.34 (1.08)
9 Months	2.04 (0.21)	1.37 (0.20)	1.46 (0.14)	1.25 (0.16)	11.66 (1.17)	7.76 (1.01)
12 Months	2.01 (0.21)	1.33 (0.22)	1.66 (0.14)	1.6 (0.16)	11.54 (1.14)	9.26 (1.27)
	Coefficient	(95% CI)	Coefficient	(95% CI)	Coefficient	(95% CI)
Model: Wald χ^2(df = 5)	150.25***		70.37***		65.02***	
Linear change (both groups)	−0.92***	(−1.18 to −0.66)	−0.56***	(−0.75 to −0.37)	−4.12***	(−6.00 to −2.24)
Quadratic change (both groups)	0.11***	(0.07 to 0.15)	0.08***	(0.05 to 0.11)	0.51***	(0.21 to 0.80)
Differential linear change (MBT-A)	−0.19**	(−0.32 to −0.07)	−0.13**	(−0.21 to −0.04)	−0.93*	(−1.82 to −0.05)
Group differences at 12 months	−0.74**	(−1.32 to −0.15)	−0.21	(−0.60 to 0.19)	−3.31*	(−6.49 to −0.12)

Note: Coefficients are odds ratios derived from a multilevel mixed effects logistic regression models. Baseline covers the 3 months preceding study entry. MBTA = mentalization-based treatment for adolescents; MFQ = Mood and Feelings Questionnaire; RTSHI = Risk-Taking and Self-Harm Inventory; TAU = treatment as usual. *p < .05 **p < .01 ***p < .001.

TABLE 3 Percentage of Participants Self-Harming and Above Cut-off Point on the Depression Screening Measure

| Categorical Measure | Self-Harm (RTSHI): n/N (%) | | Depressed (MFQ): n/N (%) | |
	TAU	MBT-A	TAU	MBT-A
Baseline	40/40 (100)	40/40 (100)	38/40 (95)	39/40 (98)
3 Months	33/37 (89)	29/35 (83)	29/37 (78)	22/35 (63)
6 Months	31/36 (86)	33/39 (85)	25/34 (74)	27/38 (71)
9 Months	28/34 (82)	22/35 (63)	23/33 (70)	14/34 (41)
12 Months	29/35 (83)	20/36 (56)	25/37 (68)	19/39 (49)
	Odds Ratio	(95% CI)	Odds Ratio	(95% CI)
Model: Wald χ^2(df=5)	9.76*		22.17***	
Linear change (both groups)	1.20	(0.46 to 3.06)	0.18**	(0.05 to 0.65)
Quadratic change (both groups)			1.25*	(1.04 to 1.52)
Differential linear change (MBT-A)	0.29*	(0.10 to 0.89)	0.68	(0.41 to 1.14)
Group differences at 12 months	0.24**	(0.08 to 0.76)	0.21*	(0.05 to 0.98)

Note: Coefficients are odds ratios derived from a multilevel mixed effects logistic regression models. Baseline covers the 3 months preceding study entry. MBT-A = mentalization-based treatment for adolescents; MFQ = Mood and Feelings Questionnaire; RTSHI = Risk-Taking and Self-Harm Inventory; SE = standard error; TAU = treatment as usual. *p < .05 **p < .01 ***p < .001.

TABLE 4 Mean Values for Borderline Personality Disorder (BPD) Diagnosis Interview and Self-Reports for Borderline Traits, Mentalization, Dissociation, Attachment Anxiety, and Avoidance Scores

Outcome Measure	Pretreatment		Posttreatment		Wald	Change over Time		Group Difference over Time	
	TAU (n = 40)	MBT-A (n = 40)	TAU (n = 30)	MBT-A (n = 29)	χ²(df = 3)	OR/IRR	95% CI	OR/IRR	95% CI
CI-BPD (proportional OR)	0.70 [0.07]	0.75 [0.07]	0.58 [0.09]	0.33 [0.09]	9.11*	0.42	0.1 to 1.71	0.07*	0.01 to 0.91
Mean BPFS-C (SE)	3.30 [0.08]	3.33 [0.08]	3.06 [0.12]	2.79 [0.10]	34.86***	−0.21*	−0.39 to −0.03	−0.29*	−0.54 to −0.03
Mean total HIF (SE)	208.0 [6.25]	201.2 [5.65]	202.7 [7.94]	219.4 [6.22]	18.1**	−3.71	−13.8 to 6.35	17.9**	3.54 to 32.3
ECR, mean avoidance (SE)	23.88 [1.14]	22.88 [1.19]	22.93 [1.29]	17.72 [1.04]	27.9***	−0.81	−2.86 to 1.23	−3.84**	−6.76 to −0.91
ECR, mean anxiety (SE)	24.93 [0.84]	24.45 [0.89]	25.03 [0.71]	24.21 [0.93]	0.41	−0.12	−1.8 to 2.04	−0.33	−3.07 to 0.91

Note: Coefficients and significance of mixed effects regression models. BPFS-C = Borderline Personality Features Scale for Children; CI-BPD = Childhood Interview for DSM-IV Borderline Personality Disorder; ECR = Experiences in Close Relationships Scale–Avoidance and Anxiety scales; HIF = How I Feel Questionnaire mean total score; IRR = incidence rate ratio; MBT-A = mentalization-based treatment for adolescents; TAU = Treatment as usual.*p < .05 **p < .01 ***p < .001.
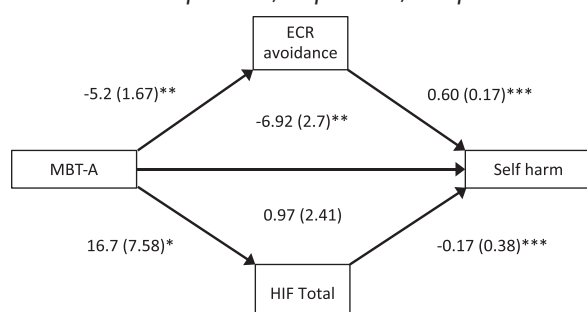
psychodynamic treatment. Using the cut-off point of 8 on the MFQ for probable clinical depression, at 9 months 41% (14/34) of the MBT-A group and 70% (23/33) of the TAU group scored in the clinical range (41% versus 70%, $p < .03$, NNT = 3.5, 95% CI = 2.07 to 21.12). At treatment end, 68% (25/37) of the TAU group and 49% (19/39) of the MBT-A group scored in that range (49% versus 68%, $p < .08$, NNT = –5.31, 95% CI = –2.45 to 30.62).

Borderline Features. The number of participants meeting BPD criteria is shown in Table 4. Mixed-effects logistic regression indicated a significant differential change in proportional odds ratios across the two measurement points (group differential rate of change: $\beta = 0.072$, 95% CI = 0 to 0.91, t[140] = –2.03, $p < .042$, d = 0.34). By 12 months, 58% (18/31) of the TAU group but only 33% (10/30) of MBT-A group met CI-BPD criteria for BPD diagnosis (Fisher's exact test, $p < .05$). Scores on the BPFSC are also shown in Table 4. The reduction in self-reported borderline personality features was significant for the combined group, but was significantly greater for the MBT-A group than for the TAU group (d = 0.36).

Process Measures

The mean HIF total scores are shown in Table 4. These reflect a combined score for accurate recognition of affect and prediction of action in hypothetical scenarios, which was used as an indicator of mentalization. Scores were unchanged in the TAU group and increased in the MBT-A group (d = 0.38). Attachment avoidance ratings on the ECR scale decreased from before to after testing in the MBT-A group only, and substantially more than in the TAU group (d = 0.42). Overall, the correlation between ECR avoidant scores and self-harm scores at the end of treatment was highly significant (r[59] = –0.55, $p < .001$), as was the change in HIF total scores between beginning and end of treatment and self-harm (r[59] = –0.48, $p < .001$). Multiple linear regression predicting self-harm scores at the end of treatment from these two variables was highly significant ($F_{2,56} = 22.81$, $p < .001$, $R^2 = 0.43$), with both ECR avoidance and HIF total scores independently contributing to the variance ($\beta = 0.62$, 95% CI = 0.30 to 0.94, t(58) = 3.88, $p < .001$ for ECR avoidance; $\beta = –0.17$, 95% CI = –0.23 to –0.10, t[58]= –4.73, $p < .001$ for HIF). Figure 2 shows that the path analytic model meets the Baron and Kenny[34] criteria; and, once changes in HIF total score and ECR avoidant scores were controlled for,

FIGURE 2 Mediation of effect of mentalization-based treatment for self-harm in adolescents (MBT-A) on self-harm scores at the end of treatment. Note: Path coefficients (SE) are shown with the association of MBT-A on self-harm. The coefficient for the path controlling for specific indirect effect of Experience of Close Relationships Inventory (ECR) avoidance and How I Feel Questionnaire (HIF) change is shown in italics.*$p < .05$, **$p < .01$, ***$p < .001$.
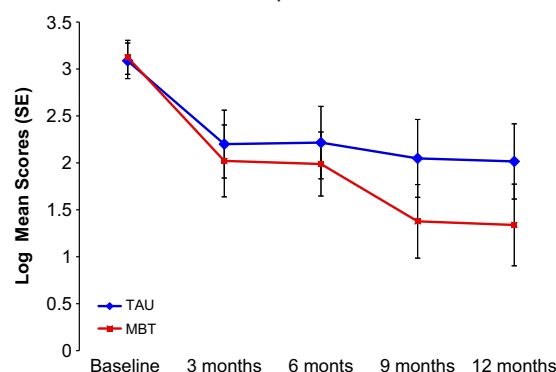

FIGURE 3 Self-harm for both groups over time on the Risk Taking and Self-Harm Inventory. Note: Group differential rate of change: $\beta = -0.049$, 95% CI $= -0.09$ to -0.02, $t(159) = -2.49$, $p < .013$, d = 0.39.

the effect of MBT-A on self-harm was no longer significant. We applied the Hayes modification[35] of the Sobel test[36] using bootstrapping to estimate indirect effects and test the significance of the indirect paths. Both indirect paths were significant ($\beta = -5.95$, 95% CI $= -6.45$ to -1.03, z = 2.36, $p < .01$ for ECR avoidance; $\beta = -2.84$, 95% CI $= -6.08$ to -0.35, z = -1.97, $p < .03$ for HIF).

DISCUSSION

In this study, we aimed to determine whether MBT-A would be more effective than routine care in reducing the recurrence of self-harm in a clinical sample of teenagers. In general, both groups benefitted from treatment in terms of self-reports and observer reports of self-harm. The effect size of linear change across the two groups was ~0.40. Recovery was not complete in either group, with 69% of the sample still self-harming at the end of 12 months of intervention. Compared with adolescents in the TAU group, those receiving MBT-A fared relatively better, with a recovery rate of 44% compared with 17% in the TAU group (Figure 3). Interview-based assessments blind to group assignment confirmed the differential effectiveness of the treatments, although estimating recovery somewhat higher (57% versus 32%), underscoring the importance of self-report with adolescents. The standardized mean difference (SMD) between baseline and posttreatment self-harm scores for the TAU group alone suggested a substantial gain (SMD = 1.06), similar to previously reviewed treatment studies.[14] Nevertheless, improvement in the MBT-A group was larger (SMD = 1.62). To our

knowledge, this is the first time that a treatment program specially developed for adolescent self-harm has been shown to be significantly more effective than TAU in terms of reducing self-harm as well as depression. In previous trials, specialist treatment programs could not be shown to be superior to routine care.[7] The clinical significance of this finding is increased by the comorbid depression in 97% of the group. The combination of adolescent self-harm and depression was recently identified as strongly indicative of subsequent suicide attempts.[1,4]

We also observed a reduction in depression scores on the MFQ along with decrease of self-harm. The SMD between baseline and posttreatment depression scores for the MBT-A group was 1.12 (d = 0.49), indicating moderate improvement. It has been suggested that depression is central in triggering self-harm,[1] and the significant correlation between MFQ and self-harm scores (r[n = 80] = 0.41, $p < .001$) may provide grounds for optimism that, at least in those adolescents whose depression remains improved, the decrease in self-harm may also be maintained beyond the end of the trial.

The results in relation to risk-taking are difficult to interpret because of the initial between-group difference. Although the MBT-A group improved more in terms of linear change, this could simply reflect regression to the mean. Controlling for the initial differences suggested that MBT-A may contribute to the reduction of risk-taking behavior. No other studies evaluating the treatment of self-harm have reported effects on risk-taking behavior. The high correlation between the two behavioral indicators at baseline (r[n = 80] = 0.45, $p < .001$)

suggests a common underlying mechanism, which in turn calls for treatment protocols that address both of these behavioral problems.

Although we did not aim to recruit individuals with BPD, nearly three-quarters of those referred met *DSM* criteria for BPD. The rate of BPD in this sample is higher than rates of BPD found in community studies[2]; however, higher rates of BPD in adolescents with self-harm have been reported in other clinical samples.[37] We noticed a reduction in both BPD diagnoses and BPD traits in the MBT-A group at the end of treatment, in line with previous reports of MBT in moderating BPD symptoms.[20,21]

The study explored the impact of MBT-A on two potential mechanisms of change: attachment and mentalization. Self-rated attachment avoidance and mentalization, but not attachment anxiety, changed in the MBT-A group. The change in mentalizing did not account for attachment avoidance, and the regression including both terms suggested strong independent associations with self-harm. Mediation analysis confirmed that both paths remained significant and that the direct effect of treatment condition was removed when changes in mentalizing and attachment avoidance were included in the path analysis. In terms of our theoretical framework, positive change in mentalizing and improvement in interpersonal functioning would be expected to bring about a reduction in self-harm.[25] This suggests that anomalies of mentalizing in adolescents[38] may be an appropriate target of intervention for those who self-harm.

Although these findings are promising, this study has several key limitations. The sample size was small. The effect sizes observed were statistically significant but modest, with the effect sizes of the difference between groups never reaching 0.5. In addition, the results concerning risk-taking behavior are difficult to interpret, given the substantial between-group difference at baseline. Despite being comparable in quantity, the comparison treatment was not manualized; it is possible that some of the difference may have arisen from the disorganizing impact of adolescents with self-harm on non-manualized treatment planning and case management. It is also possible that the rigor of weekly supervision in the MBT-A group contributed to the outcome. Finally, these results were delivered by a single provider organization. Although three separate clinical teams were involved, the generalizability of the study is limited, given that the first author was the supervisor of all three teams.

Given the lack of RCT evidence for successful therapeutic interventions for self-harm in adolescents, this initial demonstration of the usefulness of MBT-A in reducing self-harm, both as reported by adolescents and as assessed by blinded independent evaluators, indicates that larger-scale studies evaluating MBT-A for a population with comorbid depression and self-harm may be warranted. &

CG **Clinical Guidance**

- MBT-A is an effective intervention for the treatment of self-harm in terms of reduction in self-harm
- MBT-A can significantly reduce depression and borderline features in a self-harming group, as shown in this study
- Positive change in mentalizing and improvement in interpersonal functioning seem to be the mediating factors in reduction in self-harm

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SUPPLEMENT 1

Additional Notes on Adolescence and Mentalization

A clear inverse relationship exists between emotional arousal and failure in mentalization.[1] In adolescents, this is exacerbated by significant brain remodeling, which takes place during adolescence,[2,3] leaving adolescents vulnerable to mentalization failures,[4,5] which in turn leads to some of the behavioral, cognitive, and affective attributes characteristic of this age group. Given what we now understand to be the relationship between emotional arousal and mentalization, it is likely that adolescents who are depressed or who have chronic difficulties of affect regulation may be at greatest risk for a temporary loss of mentalizing, making self-harm a solution to problems of adaptation.

Further Notes on Mentalization-Based Treatment for Adolescents (MBT-A)

Treatment is divided into four phases, with expectations of what may be achieved in each. Techniques are described to deal with common crisis situations characteristic of each treatment phase. In this study, after the assessment phase, each MBT-A patient received a written formulation, which contained a crisis plan for the young person and his or her family. The MBT-A sessions were, on the whole, unstructured, focused on the youth's current and recent interpersonal experiences, and maintained a constant focus on the mental states likely to have been evoked by these experiences. As in other psychodynamic psychotherapy based on ideas from attachment theory, the final phase of the therapy addressed separation issues along with managing anticipated challenges in a mentalizing manner.

The aim of the family sessions was to improve the family's ability to mentalize, particularly in the context of family conflict.

The supervision sessions included listening to audiotaped sessions and scoring for adherence by consensus using specially developed adherence scales (a copy of the adherence scales is available from the first author on request). Those therapists who appeared not to be adherent to the manual were offered further individual training and supervision.

Sample Size

Sample size was determined using the Risk-Taking and Self-Harm Inventory (RTSHI) dimensional score of self-harm. A three-point difference between the two treatment groups was considered to be clinically important. Past research data from our program gave us a standard deviation of 3.6 for this score, producing an expected effect size of 0.8 (3/3.6). Therefore, we sought to detect a medium-to-large effect size (i.e., 0.6–0.8), and with alpha set at 0.05 and power at 0.8, a sample size of 26 to 45 persons in each group would be needed.[6] We therefore aimed to have a sample of 40 in each group. As MBT-A is a combination of individual therapy and family therapy, and assuming an ICC of 0.02 for within-therapist correlations of outcomes in the MBT-A arm, the power would reduce to 83%.

Randomization

The computer-generated adaptive minimization algorithm incorporated a random element with the following stratification factors: gender, age band (12–14 years or 15–17 years), and number of past admissions (one or none, or two or more). Minimization ensured that there was an even distribution of severity across the two arms of the trial. Adolescent participants were informed by a letter from the clinician in either arm inviting them to their first session.

Further Description and Validation of the Measures

The RTSHI is a 38-item self-report questionnaire adapted from the adult Self Harm Inventory (SHI)[7] for use with adolescents. The measure requires the adolescent to rate the frequency with which they have participated in self-harm or risk-taking behaviors, using a four-point Likert scale. The RTSHI has been shown to have acceptable reliability (Cronbach's $\alpha = 0.89$, test–retest reliability = 0.93) and validity.[8] Self-report self-harm was confirmed with an interview-based assessment of suicidal behavior taken from the Childhood Interview for *DSM-IV* Borderline Personality Disorder (CI-BPD).[9] The CI-BPD was administered at baseline and 12 months after randomization; its reliability is described below.

The Mood and Feelings Questionnaire (MFQ) has been found to correlate well with the Children's Depression Inventory (r = 0.67),[10] discriminates well between clinical and nonclinical samples, and has frequently been used in psychotherapy treatment trials of adolescent depression.[11]

The CI-BPD has been adapted from the Revised Diagnostic Interview for Borderlines,[12] and consists of nine domains that correspond to the nine *DSM-IV-TR* diagnostic criteria for BPD. In this study, the alpha value for the dimensional scale was 0.90, and the interrater agreement (intraclass correlation coefficient) was 0.95.

The Borderline Personality Features Scale for Children (BPFS-C)[13] is a modified version of the borderline personality disorder scale (BOR) of the Personality Assessment Inventory (PAI).[14] The BPFS-C is a 24-item measure with high internal consistency (Cronbach's $\alpha = 0.76$).

The How I Feel (HIF) questionnaire (unpublished data, 2008) is rooted in the emotional intelligence (EI) tradition and was developed as a performance test in the context of the Social Emotional Training (SET) project[15] in Sweden. Vrouva *et al*[8] reported Cronbach's α as 0.74 for the scale.

The Experience of Close Relationships Inventory ECR[16] contains 12 statements on how respondents act and feel in their close relationships. It yields two independent scales of attachment insecurity: attachment anxiety and attachment avoidance. The ECR is considered psychometrically to be the best self-report measure of attachment.[17]

Demographic Data

Demographic and background characteristic data were collected using a specially designed questionnaire gathering information on gender, age, living circumstances, and parental education and income. Information concerning psychosocial adversity was assessed by reviewing charts and other records. Service use associated with the treatments (requirement for additional psychotherapy sessions, pharmacotherapy, and hospitalization) were recorded by the resource use survey and information collected from the patient's electronic health record. Data extraction was independently carried out by two research assistants; reliability between them was found to be greater than 90%. The small number of disagreements was resolved by consensus.

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TABLE S1 Therapeutic Services Received by 80 Participants in the MBT-A Trial

	TAU (n = 40)	MBT-A (n = 40)
Individual therapy, n (%)	23 (58)	34 (85)
CBT, %	19	
Psychodynamic therapy, %	19	100
Counseling, %	38	
Generic/supportive therapy, %	24	
No. of sessions, mean (SD), range	9.1 (10.9), 10–40	13.8 (12.5), 0–48
Family work, n (%)	13 (33)	25 (63)
No. of sessions, mean (SD), range	3.1 (7.2), 0–37	3.8 (4.8), 0–18
Medication, n (%)	17 (43)	16 (40)
Psychiatric review sessions, mean (SD), range	3.5 (4.0), 0–17	2.1 (3.1), 0–14
Other interventions, mean (SD), range	1.7 (5.3), 0–32	0.6 (1.3), 0–6

Note: CBT = cognitive behavioral therapy; MBT-A = mentalization-based treatment for adolescents; TAU = treatment as usual.