Does improvement in maternal attachment representations predict greater maternal sensitivity, child attachment security and lower rates of relapse to substance use? A second test of *Mothering from the Inside Out* treatment mechanisms

Nancy E. Suchman[a,b], **Cindy DeCoste**[a], **Jessica L. Borelli**[c], and **Thomas J. McMahon**[a,b]

[a]Yale University School of Medicine, Department of Psychiatry

[b]Yale Child Study Center

[c]University of California, Irvine, Department of Psychology and Social Behavior

Abstract

In this study, we replicated a rigorous test of the proposed mechanisms of change associated with *Mothering from the Inside out (MIO)*, an evidence-based parenting therapy that aims to enhance maternal reflective functioning and mental representations of caregiving in mothers enrolled in addiction treatment and caring for young children. First, using data from 84 mothers who enrolled in our second randomized controlled trial, we examined whether therapist fidelity to core MIO treatment components predicted improvement in maternal reflective functioning and mental representations of caregiving, even after taking fidelity to non-MIO components into account. Next, we examined whether improvement in directly targeted outcomes (e.g., maternal mentalizing and mental representations of caregiving) led to improvements in the indirectly targeted outcome of maternal caregiving sensitivity, even after controlling for other plausible competing mechanisms (e.g., improvement in maternal psychiatric distress and substance use). Third, we examined whether improvement in targeted parenting outcomes (e.g., maternal mentalizing, mental representations of caregiving and caregiving sensitivity) was associated in improvement in child attachment status, even after controlling for competing mechanisms (e.g., improvement in maternal psychiatric distress and substance use). Finally, we examined whether improvement in maternal mentalizing and caregiving representations was associated with a reduction in relapse to substance use. Support was found for the first three tests of mechanisms but not the fourth. Implications for future research and intervention development are discussed.

When evidence-based interventions are scaled up in community-based effectiveness trials, their efficacy often drops precipitously for a number of reasons (for discussion, see Onken, Carroll, Shoham, Cuthbert, & Riddler, 2014). Intervention delivery may inadvertently drift

Correspondence should be addressed to the first author at the Moms 'n' Kids Program, One Long Wharf Drive, Suite 310, New Haven, CT 06511, (203) 285-1472 (voice), (203) 285-1469 (fax), nancy.suchman@yale.edu.

from its originally-intended format. Local setting characteristics and limited resources might alter or compromise intervention delivery. Some intervention characteristics (e.g., duration, format, intensity) might require adaptation to local settings. Knowing which core components of an intervention are essential to its effectiveness in community settings prior to launching effectiveness and implementation trials may help stem the precipitous plunge over the implementation cliff.

In this investigation, we were interested in replicating a test of the treatment components and mechanisms of *Mothering from the Inside out (MIO*; Suchman, DeCoste, Ordway, & Bers, 2013), an evidence-based parenting therapy for mothers enrolled in addiction treatment and caring for young children. *MIO* is grounded in attachment theory and emphasizes a mother's capacity to mentalize (i.e., make sense of mental and emotional experiences in herself and her child) and enhance her mental representations of the caregiving relationship. *MIO* has now demonstrated efficacy in two randomized controlled trials for improving maternal capacity to mentalize, mental representations of caregiving, and maternal caregiving behavior with children birth to five years of age (see Suchman, DeCoste, McMahon, Rounsaville & Mayes, 2011; Suchman, DeCoste, McMahon, Dalton, Mayes, & Borelli, 2017). Previously (see Suchman, DeCoste, Rosenberger, & McMahon, 2012), we examined MIO's proposed mechanisms of change using data collected during the first randomized trial and found that therapist fidelity to unique MIO components was associated with improvement in maternal mentalizing and caregiving representations at post-treatment, even after controlling for generic alliance-building components. We also found that improvement in maternal mentalizing and caregiving representations was associated with improvement in maternal caregiving behavior at post-treatment, even after controlling for reduction in both psychiatric symptoms and substance use. Although this prior investigation supported the premise that targeting maternal mentalizing capacity and caregiving representations (and not simply fostering the therapeutic alliance) is essential to fostering improvement in maternal mentalizing, caregiving representations and caregiving behavior with mothers in addiction treatment, the study's cross-sectional design prevented any conclusions about temporal relationships between mechanisms. The aim of the current study was to use data from the second randomized trial to determine if findings from the first test of mechanisms could be replicated when testing temporal associations between mechanisms. We were also interested in examining mechanisms associated with two additional outcomes – child attachment and maternal substance use.

Why Mentalization-based Interventions for Mothers in Addiction Treatment?

As a group, mothers who have histories of chronic substance use are at greater risk than mothers with no substance use history for losing custody of their minor children (Choi & Ryan, 2007; Department of Health and Human Services, 1999; Grant, Huggins, Graham, Ernst, Whitney, & Wilson, 2011) and for interacting with them in problematic ways (Burns, Chetik, Burns, & Clark, 1997; Hans, Bernstein, & Henson, 1999). Addiction severity among childrearing women in addiction treatment has increased in recent years (Greenfield, Back, Lawson, & Brady, 2010) but treatment programs are not equipped yet to address parenting problems. Recent developments in the neuroscience of addiction and parenting suggest a significant overlap in the neural circuitry involved with chronic drug use and parenting

(Rutherford, Williams, Moy, Mayes, & Johns, 2011; Strathearn, Fonagy, Amico, & Montague, 2009; Strathearn, 2011). Chronic drug use co-opts the same neural reward pathways that are involved during parenting. The result can be decreased reward sensitivity, increased stress activation and an increased propensity towards relapse in the parenting role. Increasingly, heroin and opioids are being used at younger ages across broader socioeconomic strata (Jones, 2008; Seelye, 2015). As they move into childbearing years, substance users are at greater risk for experiencing diminished reward and heightened distress as they adopt parenting roles. Taken together, these recent developments suggest the need for parenting interventions, provided as part of addiction treatment, that target the emotional consequences of a compromised stress-reward system, especially consequences associated with parenting role role.

Mothering from the Inside Out

Mothering from the Inside Out (MIO) is a manualized 12-session individual therapy provided in conjunction with addiction treatment. MIO aims to enhance a mother's capacity to mentalize about her experience in the parenting role and to develop more nuanced mental representations of the caregiving relationship she has with her child (Suchman et al., 2013). Mentalization is defined as the capacity to make sense of mental (especially emotional) states— that is, how they influence behavior and relationships (Fonagy, Steele, Steele, Leigh, Kennedy, Mattoon, & Target, 1995). Recent attachment research suggests that parental mentalizing, even more so than parental sensitivity, is a critical factor in the transmission of secure attachment from one generation to the next (Fonagy, Steele, Steele, Moran, & Higgit, 1991; Slade, Grienenberger, Bernbach, Levy, & Locker, 2005).

Mentalization is thought to have a self-focused and other-focused component (Fonagy, Gergely, Jurist, & Target, 2002). Parental child-focused mentalizing is the parent's capacity to make sense of her child's strong emotions and their impact on herself (Suchman et al., 2010). Child-focused mentalizing often involves adopting a developmental perspective about the child's growing capacities (e.g., cognitive, verbal and motor abilities) and drawing inferences about the meaning of emotions and behaviors based solely on nonverbal cues from infants (Slade, 2005). Parental self-mentalizing is the parent's capacity to make sense of her own strong emotions and their impact on her child (Suchman, DeCoste, Leigh, & Borelli, 2010). Parental self-mentalizing enables the parent to recognize, understand *and thereby regulate* her own mental and emotional distress and its potential impact on the child (i.e. self-focused mentalizing). *This latter capacity is particularly relevant to mothers in addiction treatment because heightened distress and limited coping skills make them more vulnerable to emotional dysregulation and relapse.*

The degree to which a parent develops nuanced mental representations of the caregiving relationship, a construct closely related to parental mentalizing, is also thought to be related to the parent's capacity for sensitive caregiving interactions. More nuanced representations that accommodate a child's positive and negative characteristics, rapidly shifting developmental capacities, emotional attachment-based needs and unique personality characteristics have been associated with greater caregiving sensitivity (Bretherton & Munholland, 2008).

The MIO treatment model is grounded in the attachment-based premise that, as the quality of maternal self-focused RF, child-focused RF, and mental representations of caregiving improves, improvement in maternal caregiving sensitivity and child attachment security will follow. MIO therapy is based on the *Mentalization-Based Therapy* (MBT) model developed by Allen, Fonagy, and Bateman (2008), which emphasizes the restoration of mentalizing and representational capacities under conditions of arousal by engaging in guided mentalizing practice (Bateman & Fonagy, 2012). MIO targets parental RF and mental representations so that mothers can better manage emotional distress in the absence of neural reward, a common deficit that is often present during chronic substance use episodes and early recovery from addiction. Because improvement in the quality of maternal mentalizing and mental representations of caregiving may also indicate a greater capacity to regulate emotion in the parenting role and experience a more positive attachment to the child, it is conceivable that a reduction in substance abuse may also follow.

Testing Mechanisms of Change: A more rigorous approach

Randomized controlled trials examining the efficacy of attachment-based interventions have been increasing in recent years (e.g., Bernard, Dozier, Bick, Lewis-Morrarty, Lindhiem, et al., 2012: Cassidy, Woodhouse, Sherman, Stupica, & Lejuez, 2011; Moss, Dubois-Comtois, Cyr, Tarabulsy, St-Laurent, & Bernier, 2011; Sadler, Slade, Close, Webb, Simpson et al., 2013). However, few studies adequately measure treatment integrity and integrity-outcome associations. Researchers examining integrity-outcome associations have often encountered challenges in their efforts to isolate the unique therapeutic components that may be responsible for treatment outcomes. They have also found challenges in disentangling treatment, therapist and client characteristics from the unique effects of treatment components on outcome (see Hogue, Henderson et al., 2008; Perepletchikova & Kazdin, 2005). Most investigations of mechanisms of change have relied on simple tests of mediation to confirm therapeutic mechanisms (Nock, 2007). Tests of change mechanisms can be strengthened by comparing unique and experimental treatment components with more universal and generic treatment components (e.g., alliance-building) in terms of their influence on targeted treatment outcomes. Likewise, tests of change mechanisms can also be strengthened by comparing competing mechanisms of change (e.g., improvement in substance use vs improvement in mental representations of caregiving) to determine what each contributes to improvement in targeted outcomes.

Study Aims

In this study, we tested four hypotheses about proposed mechanisms of change: First, we examined whether therapist fidelity to unique MIO treatment components predicted improvement in maternal mentalizing capacity and caregiving representations at the end of treatment, even after controlling for therapist fidelity to generic alliance-building components and to components associated with the comparison intervention. Specifically, we predicted that (a) therapist efforts to support maternal self-focused mentalizing would lead to improvement in self-focused mentalizing, (b) therapist efforts to support child-focused mentalizing would lead to improvement in child-focused mentalizing, and (c) therapist efforts to support self-focused and child-focused mentalizing would lead to

improvement in maternal mental representations of the caregiving relationship. Second, we were interested in determining whether improvement in mentalizing and caregiving representations at the end of treatment would predict improvement in maternal sensitivity during mother-child interactions at the 3 month follow up, even after controlling for improvement in maternal psychiatric distress and substance use at the end of treatment. Third, we tested whether improvement in maternal mentalizing, caregiving representations and/or maternal sensitivity at the end of treatment predicted improvement in child attachment security at the end of treatment, even after controlling for improvement in maternal psychiatric distress and substance use (Note: In this case, the design is cross-sectional because attachment status was not reassessed at follow up). Finally, we examined whether improvement in maternal mentalizing and caregiving representations at the end of treatment predicted a reduction in substance use, even after controlling for improvement in maternal psychiatric distress.

Method

Study Design

Data for this study were collected as part of the second randomized clinical trial testing the efficacy of *Mothering from the Inside Out (MIO)*, a weekly individual parenting therapy, against an active comparison intervention called Parent Education (PE). Both interventions were provided as adjuncts to standard outpatient substance abuse care provided at a large northeastern inner city clinic where the study was conducted. Mothers and target children completed assessments at baseline, post-treatment, and 3 month and 1 year follow up (for a complete report on the randomized trial, see Suchman, DeCoste, McMahon, Dalton, Mayes, & Borelli, 2017).

Recruitment and Consent Procedures

English speaking mothers enrolled in the outpatient substance abuse treatment caring for a child between 11 and 60 months of age were eligible to participate. Mothers with severe mental health problems (e.g., suicidality, psychosis), significant cognitive impairment, or requiring detoxification were excluded. Dyads with seriously ill or developmentally-delayed children were also excluded.

Mothers were recruited via flyers and announcements in their clinics. Eligible mothers completed an initial screening and informed consent procedures with a study research assistant. Mothers caring for more than one eligible child were asked to choose a child to participate. Mothers who had a child living with a relative were permitted to enroll if she had regular contact with the child on a minimum of 3 days per week per maternal and legal guardian report. When relevant, custodial relatives and legal guardians were asked for written consent for the child to participate.

Sample

One hundred eligible mothers consented to participate. Of these, 87 completed the intake interview and were randomized to treatment (40 MIO, 47 PE) and 84 (38 MIO, 46 PE) completed the play session with the target child and at least one parent interview (e.g., the

PDI or WMCI) and comprised the sample for this investigation. Fifty-nine of the mothers (28 MIO, 31 PE) completed the Strange Situation Paradigm and a developmental screening with the target child. Treatment fidelity was assessed for 428 sessions from a randomly selected pool of 37 mothers (15 MIO, 22 PE) who attended 11 sessions, on average. Sixty-two mothers (27 MIO, 35 PE) completed treatment and post-treatment assessments, and forty-five mothers (18 MIO and 27 PE) completed the 3-month follow up.

As shown in Table 1, mothers' mean age was 29.90 ($SD = 5.29$), mean years of education completed was 12.44 ($SD = 2.18$), and mean number of minor children in their care was 1.67 ($SD = .99$). Most mothers were Caucasian (78.6%) and unemployed (80%). The largest percentage (40.5%) had never been married. Most mothers (84.5%) carried a primary diagnosis of heroin or non-prescription opioid dependence and 73.0% were enrolled in methadone-maintenance. Approximately one-third (31.0%) of the target children were involved with Child Protective Services.

Fathers of target children (per mothers' reports) averaged 34.37 years of age ($SD = 7.50$) and 46.4% were living with the mother and target child. Most fathers were employed (63.0%) and had histories of substance use (76.0%).

The average age for target children was 27.92 ($SD = 14.88$) months and about half (54%) were male. Most target children (96.4%) lived with their mother. Fifteen percent of children ages 11–36 months scored as either emerging or present risk on the Cognitive Scale, 24.3% on the Receptive Communication Scale, and 16.2% on the Expressive Communication Scale on the Bayley Developmental Screen,. 5.3% of the children ages 37–60 months scored below average on the Cognitive/Language Scale on the Early Screening Profile.

Assessment Procedures

Baseline—Mothers completed six weekly baseline assessment visits (1 – 2 hour duration) during which the mother completed a battery of assessments that included an intake and intelligence evaluation, interviews to assess reflective functioning and caregiving representations, and surveys about their psychiatric symptom and substance abuse. Mothers and target children together completed interactive play sessions that assessed interaction quality, child developmental status and child attachment status. Mothers were compensated for completing research assessments. Mothers were randomized to treatment in the second baseline assessment week and met briefly (20 minutes) with their assigned MIO therapist or PE specialist to share reasons for participating in the study.

Treatment—Treatment began the 12 week treatment phase after completing baseline assessments. Individual sessions lasted one hour after which mothers completed brief surveys about their recent substance use and additional services received in the community. Mothers completed brief psychiatric questionnaires at four week intervals.

Post-treatment—At the end of treatment, all baseline measures were repeated (except intake and intelligence evaluations).

Follow up—Mothers completed surveys on psychiatric symptoms, substance use and additional services received twice-monthly during the 3-month follow up period at the end of which, all post-treatment assessments were repeated (except for child attachment status). One year after mothers completed the 3 month follow up assessment), they returned with the target child to complete an interaction assessment an interview about changes in their parenting, education, employment, housing, and legal involvement.

Parent Education Comparison

Parent Education (PE) was designed (DeCoste, Dalton, de las Heras Kuhn, & Dennehy, 2010) to represent community-based parent education programs and was equivalent to MIO in format (individual treatment) and dose (weekly one hour sessions). Like MIO, PE was tailored to mothers' specific concerns. PE counselors provided developmental guidance and parent training in typical dilemmas encountered by parents of young children (e.g., child tantrums, bed wetting, sleep habits, and limit setting) and parents in substance abuse treatment (e.g., keeping children safe, maternal self-care, co-parenting conflicts). A series of 4th grade reading level pamphlets were developed for this study to cover topics of concern without significant overlap with the MIO therapy process.

Measures

Developmental Screening—Developmental Screening: Children aged 11–36 months were assessed using the Bayley Scales of Infant and Toddler Development Screening Test (3rd Edition; Bayley, 2006) and children aged 36–60 months were assessed using the Early Screening Profiles (ESP; Harrison et al., 1990). Both measures screen for potential delays in cognitive and language functioning. Children were screened by trained research assistants at baseline so that at-risk children could be promptly referred for further assessment.

Treatment fidelity—The 11-item *Revised MIO/PE Adherence Rating Scale* (Suchman, Rosenberger, & DeCoste, 2010) was used to measure treatment fidelity (see Suchman et al., 2017 for details on scale development and validity). The scale contains generic items measuring *alliance-building* efforts that were expected to occur equally in both MIO and PE (e.g., "Builds alliance through listening and making encouraging, supportive statements"), unique MIO items measuring the therapist's efforts to promote *mentalizing-for-mother* (e.g., "Explores how mother's thoughts and emotions might affect the child") or *mentalizing-for-child* (e.g., "Explores thoughts and emotions underlying the child's behavior), and unique PE items measuring therapist efforts to provide *behavioral guidance* (e.g., "Provides developmental guidance about child behavior and behavior-based parenting strategies"). Three independent raters trained by author N.S. rated 36 randomly selected sessions to establish. Interclass correlations for the 11 items ranged from .74 ($p < .05$) to .96 ($p < .001$). Raters coded 428 sessions from a randomly selected pool of 37 subjects (MIO = 15 and PE = 22) who attended 11 sessions, on average.

Psychiatric distress—Psychiatric symptoms were assessed with the Global Severity Index (Cronbach's α = .97 for this sample) from the *Brief Symptom Index* (BSI; Derogatis, 1993). Raw scores were converted to *T-Scores* using tables provided by the measure author

for interpretation purposes. *T* scores between 40 and 60 are considered within the normal range whereas scores above 60 are considered clinically significant (Derogatis, 1993).

Substance use—The *Timeline Followback* interview (TLFB; Sobell & Sobell, 1992, 1996) was used to assess maternal substance abuse. The TLFB uses a calendar to gather estimates of daily substance use retrospective over a specified time period. Good psychometric properties have been reported for the TLFB, including temporal stability for substance use, convergent and discriminant validity, and moderate to high correlations with urine assay results (Fals-Stewart, O-Farrell, Freitas, McFarlin, & Rutigliano, 2000). For each month of participation in the study, a mother received a score of "0" if she reported no use of the substance and a score of "1" if she reported at least one relapse to any substance during that month.

Reflective functioning—*Parent Development Interview* (PDI; Slade, Aber, Berger, Bresgi & Kaplan, 2003) was used to measure maternal reflective functioning. The PDI is a 33-item semi-structured interview that requires a parent to describe particular interactions with the target child. Some questions are designed to probe for mental states in the mother (e.g., "Have you ever been angry as a parent?" "Can you tell me about a time recently when you felt that way?") or the child (e.g., "Does your child ever get emotionally upset?" "Can you tell me about the last time that happened?") Other questions of a more general nature (e.g., "Can you tell me about a time in the last week that you and your child really clicked?") are designed to permit rather than demand mentalizing activity. For this study, a brief, 14-item version of the PDI was developed, with the PDI author's permission, to minimize assessment burden, overlap with the *Working Model of the Child Interview*, and cover positive emotions (e.g., "Have you ever felt deeply touched or moved as a parent?") that substance abusing adults sometimes struggle to manage.. Interviews (typically one hour duration) were video-recorded and transcribed. Transcripts were then coded a −1 to 9 scale based quantity and quality of mentalizing. A score 3 indicates 'pre-mentalizing' or an absence of awareness of mental states beyond vague, unelaborated, cliché-like references (e.g., "He doesn't have a care in the world"). A score of 5 indicates adequate mentalizing, a demonstrated awareness of mental states and how they influence behaviors and relationships (e.g., "I know when she likes her snack because she smiles and claps her hands … and that makes me proud"). Higher scores indicate more complex and nuanced understanding of mental states and how they influence behavior and relationships. PDIs were coded by author J.B. who was blind to time point, all other subject information. Interclass correlations ranged from .77 (*p* < .05) to .98 (*p* < .001) in a randomly selected sample of ten transcripts.

For this investigation, we were most interested in examining *self-focused* and *child-focused* reflective functioning, two dimensions that were empirically validated in previous work (see Suchman, DeCoste, Leigh, & Borelli, 2010). *Self-focused RF* involves the mother's capacity to mentalize about her own strong emotions and their impact on her child and is comprised of four items that ask the mother to consider times she felt pain or difficulty, anger, and neediness as a parent and about how having the target child had changed her. *Child-focused RF* involves the mother's capacity to mentalize about her child's strong emotions and their impact on the mother herself. This scale is comprised of five items that ask the mother to

consider times that she and her child were clicking and not clicking and times her child might have felt emotionally upset or rejected or needed her attention. In this sample, Cronbach's alpha coefficient was .53 and .63, respectively.

Mental representations of caregiving—The Working Model of the Child Interview (WMCI; Zeanah & Benoit, 1993) was used to measure maternal mental representations of the caregiving relationship. The WMCI is a semi-structured interview used to assess the content and quality of a parent's mental representations of the caregiving relationship with children ages birth to six. The interview includes questions about the mother's perceptions of distinctive characteristics of the child and their relationship, focusing primarily on times when the child's attachment needs are typically activated (e.g., parent-child separations, child illness or injury). The 15-item version of the interview developed with permission from the measure's author was used to minimize assessment burden. Six 5-point scale items were used to characterize representation quality, including *Richness* (degree of elaboration), *Openness* (acceptance and flexibility), *Coherence* (clarity of narrative), *Caregiving Sensitivity* (responsiveness to child's emotional distress), *Acceptance* (acknowledgement of parental role) and *Emotional Involvement* (investment in the relationship). A score of 3 (range 1–5) is considered the "benchmark" for adequate though unremarkable quality on each scale. Scores ≤ 2 represent potential risk for the caregiving relationship. Video-recorded interviews were coded by a clinical psychologist (trained by author, N.S.) Interrater reliability was assessed in a randomly selected interviews. Interclass correlations ranged from .77 (*p* < .01 to .91 (*p* < .001). The mean score for the six items represented overall representational quality and yielded a Cronbach's α of .88 for this sample.

Caregiving sensitivity—To examine maternal caregiving sensitivity we used the *Curiosity Box Paradigm* (CBP; Mayes, Carter, & Stubbe, 1993). The mother and child explored a box with 12 toys in two sequential f-minute episodes, the first with familiar toys (to acclimate the dyad) and the second with scary toys (e.g., rubber snakes, plastic bugs) selected to elicit the child's uncertainty. Video recordings of the second episode were coded using the *Coding Interactive Behavior* system (CIB; Feldman, 1998). In this study, the *12-item Maternal Sensitivity Scale* composite scale (Cronbach's α = .93) was used to represent caregiving sensitivity. All sessions were coded by a rater (trained by the measure author) who was blind to time, treatment assignment, and other subject information. Ten randomly selected interactions were coded by a second trained rater (author C. D.) to establish interrater reliability. Interclass correlations for the 12 items ranged from .77 (*p* < .05) to .99 (*p* < .001).

Child attachment—Target child attachment classification was evaluated using The *Strange Situation Procedure* (SSP; Ainsworth, Blehar, Waters, & Wall, 1978). The Ainsworth SSP (8 episodes, 3 with a stranger; Ainsworth et al., 1978) for children younger than 24 months and the MacArthur Preschool SSP (5 episodes, with no stranger; Cassidy & Marvin, 1992) for children older than 24 months (and up to 54 months) were used to examine changes in attachment status across three global domains: Secure, Insecure, and Disorganized. The SSP was video recorded and then coded by two raters reliable on both

methods. Interrater reliability of global attachment classifications was established with 10 randomly selected videos with yielding an interclass correlation of .72 ($p < .05$).

Data Analysis

Missing data and sample differences—For subjects who completed baseline assessments only (n = 17), missing values for later time points were replaced with baseline values as a conservative estimate that assumed no improvement. For subjects who completed baseline and post-treatment assessments but missed follow-up assessments (10% of the intention-to-treat sample), missing values were replaced by the group mean. To insure that mean substitution did not significantly alter (i.e., reduce) variance (see Schafer & Graham, 2002), equivalence of variances was confirmed across the three time points and no significant differences were found.

T-tests for independent samples were conducted to identify significant differences in any study variables between mothers and children who completed the Strange Situation Paradigm and those who did not. No group differences were found on any variable. Likewise, we conducted t-tests for independent samples to test for significant differences in all study variables between mothers whose treatment sessions were evaluated for fidelity and mothers whose sessions were not. Again, we found no group differences for any of the variables.

Difference scores—To represent changes in psychiatric distress, substance use, reflective functioning, mental representations of caregiving and caregiving sensitivity, baseline scores were subtracted from later time points (e.g., scores at post-treatment or 3-month follow up; see Gottman & Rushe, 1993; Rogosa, 1995). Because we were most interested in testing mechanisms of change associated with *change* in attachment classification, we created an ordinal scale where a score of −1 represented a decline to a more insecure classification (e.g., secure → insecure; secure or insecure → disorganized), a score of 0 represented either (a) no pre-to-post treatment change from an insecure or disorganized classification or (b) maintenance of a secure classification, and a score of 1 represented change to a more secure classification (e.g., disorganized → insecure; disorganized or insecure → secure).

General strategy for testing mechanisms of change—Hypotheses involving continuous outcomes (e.g., change in reflective functioning, caregiving sensitivity, and substance use) were tested in hierarchical linear regression analyses where covariates (child age and gender and maternal education) were entered in the first block, potential competing mechanisms in the second block, and predicted mechanisms in the third block. We examined the overall effect (R^2) for each block to identify shared variance as well as the unique variance explained by each predictor. In order to test temporal associations between mechanisms and outcomes, we entered difference scores representing post-treatment change in blocks 2 and 3 and used difference scores representing change at 3-month follow up for all continuous outcomes. Because of the small sample size (including the restricted sample where fidelity assessments were available), prior to analyses, we determined that effect size was the best indicator of meaningful results. Following guidelines established by Cohen and Cohen (1983), where $R^2 > .01$ represents a small effect, $R^2 > .09$ a medium effect, and $R^2 > .$

25 a large effects, we rejected the null hypothesis at the R^2 value of .05 or higher (representing a small-to-medium effect) and considered beta weights associated with R^2 values of .05 and higher to be interpretable indicators of effect direction.

The hypothesis involving post-treatment change in attachment status (ordinal outcome) was tested in an ordinal regression analysis where all covariates (child age and gender and maternal education) and competing mechanisms (e.g., post-treatment change in psychiatric distress, substance use, self- and child-focused reflective functioning, mental representations of caregiving and caregiving sensitivity) were entered simultaneously as predictors. The resulting odds ratios for each predictor were then interpreted as effect size. The null hypothesis was rejected only if the confidence interval did not cross 1.00. Note: this model tested cross-sectional and not temporal associations because attachment status was only assessed at baseline and post-treatment visits.

Results

Descriptive Data

Descriptive data for all variables of interest are shown in Table 2. At baseline, as a group, mothers reported clinically significant levels of psychiatric distress (*T Score mean* = 60.37, SD = 10.06). Forty-six percent reported at least one instance of substance use relapse during the baseline month. RF scores fell at a pre-mentalizing level (Self-focused RF *mean* = 2.94, *SD* = .65; Child-focused RF *mean* = 3.18 *SD* = .59), mental representations of the caregiving relationship fell below the benchmark for adequacy (*mean* = 2.54, *SD* = .37), and the average maternal sensitivity score was 3.50 (*SD* = .73). At baseline, 57.1% of the target children were classified as secure, 21.5% as insecure (avoidant or resistant), and 21.4% as disorganized.

At post-treatment, as a group, mothers reported psychiatric distress levels that fell within normal limits (*T Score mean* = 55.91, SD = 10.47). Thirty-one percent reported at least one instance of relapse to substance use during the post-treatment month. RF scores corresponded to a pre-mentalizing level (Self-focused RF *mean* = 2.98, *SD* = .61; Child-focused RF *mean* = 3.32 *SD* = .55), mental representations of caregiving fell below the benchmark for adequacy (*mean* = 2.64, *SD* = .37), and the average maternal sensitivity score was 3.49 (*SD* = .78). At post-treatment, 58.1% of target children were classified as secure, 35.5% as insecure, and 6.5% as disorganized.

At 3 month follow up, 25% reported at least one instance of relapse to substance use and the average maternal sensitivity score was 3.44 (*SD* = .76).

Treatment Fidelity and Change in Maternal Reflective Functioning and Caregiving Representations

Change in self-focused reflective functioning at post-treatment—As shown in Table 3, the covariate block explained 14% of the variance in change in self-focused RF at post-treatment, with maternal education explaining 11% unique variance. Beta weight indicates that improvement in self-focused RF at post-treatment was associated with fewer years of education completed. After controlling for covariates, therapist fidelity to alliance

building and behavioral guidance did not explain significant variance in change in self-focused RF. After controlling for covariates and therapist fidelity to non-mentalizing components, therapist fidelity to exclusive mentalizing components explained 10% of the variance in change in self-focused RF, with self-focused mentalizing explaining 5% unique variance. The beta weight indicates therapist efforts to promote self-focused mentalizing were associated with improvement in self-focused RF.

Change in child-focused reflective functioning at post-treatment—As shown in Table 3, the covariate block explained 7% of the variance in change in child-focused RF at post-treatment. After controlling for covariates, fidelity to alliance building and behavioral guidance components did not explain significant variance in change in child-focused RF at post-treatment. After controlling for covariates and therapist fidelity to non-mentalizing components, therapist fidelity to exclusive mentalizing components did not predict significant variance in child-focused RF at post-treatment.

Change in maternal representations of caregiving at post-treatment—As shown in Table 3, the covariate block did not explain significant variance in change in maternal representations of caregiving at post-treatment. After controlling for covariates, fidelity to alliance building and behavioral guidance components did not explain significant variance. After controlling for covariates and therapist fidelity to non-mentalizing components, therapist fidelity to exclusive mentalizing components explained 31% of the variance in change in mental representations of caregiving, with improvement in self-focused mentalizing explaining 11% unique variance. The beta weight indicates that therapist efforts to promote self-focused mentalizing were associated with improvement in mental representations of caregiving.

Maternal Reflective Functioning, Mental Representations of Caregiving and Sensitivity

As shown in Table 4, the covariate block explained 6% of the variance in change in maternal sensitivity at 3-month follow up. After controlling for covariates, change in psychiatric distress and substance use at post-treatment did not explain significant variance in maternal sensitivity at follow up. After controlling for covariates and competing mechanisms, improvement in maternal RF and caregiving representations together explained 8% of the variance in improvement in maternal sensitivity. Together, the beta weights suggest a positive association between improvement in Step 3 variables and improvement in maternal sensitivity.

Change in Maternal Reflective Functioning, Mental Representations of Caregiving, Sensitivity and Child Attachment Status at Post-Treatment

As shown in Table 5, improvement in mentalizing (self- and child-focused) and mental representations of caregiving did not predict improvement in child attachment security at post-treatment. However, improvement in maternal sensitivity did predict improvement in child attachment security at post-treatment. The odds ratio indicates that, with other factors held constant, the odds of the target child's attachment classification becoming more secure at post-treatment was 3.61 times greater for each point of increase in maternal sensitivity.

Change in Maternal Reflective functioning and Mental Representations at Post-treatment and Change in Relapse to Substance Use at 3-Month Follow Up

As shown in Table 6, the covariate block did not explain significant variance in change in relapse to substance use at follow up. After controlling for covariates, change in psychiatric distress at post-treatment did not explain significant variance in change in relapse rate follow up. After controlling for covariates and change in psychiatric distress at post-treatment, improvement in maternal reflective functioning and mental representations of caregiving did not explain significant variance in change in relapse at follow up.

Discussion

In this study, we examined the proposed mechanisms of change for *Mothering from the Inside Out (MIO)*, a mentalization-based parenting therapy for mothers enrolled in addiction treatment. We were interested in whether our original findings from the first randomized controlled trial (Suchman et al., 2012) could be replicated with data from the second randomized trial. We were also interested in examining mechanisms associated with two additional outcomes – child attachment and maternal substance use – which were not examined in the earlier study. Support was found for most of the same mechanisms tested in the first trial and temporal associations were also established. Each finding is discussed, in turn, along with new tests of mechanisms for attachment and substance relapse outcomes, followed by a discussion of implications for future research and intervention development.

Treatment Fidelity, Maternal Mentalizing and Caregiving Representations

As in the earlier study, therapist fidelity to the unique MIO components was generally associated with post-treatment improvements in maternal reflective functioning and caregiving representations. Even after controlling for the therapist's alliance building and behavioral guiding efforts, the therapist's effort to promote mentalizing skills was the strongest predictor of improvement in maternal self-focused reflective functioning and mental representations of caregiving at the end of treatment. This finding is noteworthy for several reasons: First, although a number of meta-analytic studies (e.g., Horvath & Symonds, 1991; Martin, Garske, & David, 2000) have shown that therapeutic alliance is a better predictor of treatment outcome than intervention approach, per se, our finding suggests that, for mothers in addiction treatment, therapeutic alliance may not be sufficient for improving reflective functioning or mental representations of caregiving. This conclusion remains tentative, though, because therapeutic alliance is not the same as therapist effort to build alliance. It would be important for future research to measure therapeutic alliance, especially from the patient's perspective, to clarify its association with change at the representational level. Second, these findings suggest that targeting parenting behaviors through behavioral guidance alone without first helping mothers understand their own internal experiences in the parenting role and the internal emotional needs driving their children's behavior may not be sufficient for mothers with addictive disorders.

Child-focused reflective functioning was not predicted by therapist efforts to promote mentalization of the child (or of the mother). As reported previously, in both trials, we found that therapists devoted the greatest effort to helping mothers mentalize about their own

strong emotions more often than those of the child, and that this approach seemed appropriate because (a) mothers' self-focused RF was lower than their child-focused RF (see Suchman et al., 2011, 2017) and (b) mothers' self-focused RF was a better predictor of caregiving behavior than child-focused RF (see Suchman et al., 2010).

Maternal Reflective Functioning, Caregiving Representations and Caregiving Sensitivity

As in the earlier study, improvement in maternal reflective functioning and caregiving representations at the end of treatment was associated with improvement in maternal caregiving sensitivity at the 3-month follow up, even after controlling for competing mechanisms (improvement in psychiatric distress and substance use). This finding supports the premise that absence of psychiatric distress and abstinence from substance use alone are not sufficient conditions for improving parenting. Moreover, it lends support to the attachment-based premise on which the intervention is based, that maternal reflective functioning and mental representations of the caregiving relationship play a critical role in parenting behavior of mothers with addictive disorders and that targeting mental representations as well as parenting behaviors can lead to improvement in parenting behavior.

Maternal Reflective Functioning, Caregiving Representations, Caregiving Sensitivity and Child Attachment Security

Improvement in child attachment security at post-treatment was associated with improvement in maternal caregiving sensitivity at post-treatment. This finding supports the premise that caregiving sensitivity may be the mechanism responsible for the transmission of secure attachment from one generation to the next. Improvement in maternal reflective functioning and mental representations of caregiving was not associated with improvement in attachment security, which suggests that these capacities may play a more indirect role in secure attachment through their influence on the capacity for caregiving sensitivity. It may also be that our findings are influenced by the cross-sectional design of this study component. Attachment status was assessed at baseline and post-treatment but not follow up. It is possible that child attachment security would improve at follow up as a function of improvement in maternal reflective functioning (we are testing the premise in our current trial). Alternatively, our findings support a longitudinal model where improvement in mentalization and representations leads to improvement in maternal sensitivity which, in turn, leads to improvement in child attachment status (a longer chain of temporal events that could be tested in future research).

Maternal Reflective Functioning, Caregiving Representations and Substance Use

Contrary to expectations, we did not find support for the hypothesis that, after controlling for improvement in psychiatric distress, improvement in maternal reflective functioning and mental representations of caregiving at post-treatment led to a reduction in relapse at the 3-month follow up. Although there was a small positive effect, it failed to meet our criteria for rejecting the null hypothesis. It may be that MIO's focus on mentalizing about the mother's experiences as a parent may be too narrow to impact her relapse behavior. Expanding the therapeutic approach to include mentalizing about relapse incidents might help strengthen the intervention's impact on substance use. In a current ongoing investigation, addiction

counselors, who have expertise in addiction treatment, are being trained to deliver MIO in community-based addiction treatment centers. Their MIO treatment protocol includes mentalizing about relapse incidences as well as stressful parenting situations. Replicating a test of mechanisms in the new trial will continue to shed light on MIO's potential for influencing relapse rates.

Study Limitations

Without a measure of attachment classification at the 3-month follow up, it was impossible to test temporal associations of potential mechanisms involving attachment as an outcome. In the new ongoing trial, we will be testing attachment status at all three time points. This will allow us to test whether improvement in representations at the end of treatment might lead to improvement in child attachment status after a period of consolidation.

The small sample size compromised the statistical power to identify significant effects. Intervention research with treatment populations that are at risk for parenting difficulties often involve small to moderate sized samples. Combining data across trials will help to combat issues of limited power. We are currently planning to conduct secondary analyses combining data across the first two trials in order to replicate the current and prior investigations.

The alpha coefficients for self-focused and child-focused RF (.53 and .63, respectively) are moderate, indicating that the scale items are not measuring the intended constructs well. Typically, alpha coefficients for PDI scores are not reported so it is impossible to compare scale performance in this study with other studies. The moderate internal consistency in this study may be influenced by the small number of scale items (four and five items, respectively) and the small sample size as alpha coefficients are sensitive to both. It may be that additional items on the self-focused and child-focused scales would help to boost their internal consistency. Future efforts to report alpha coefficients for PDI scales would help clarify their psychometric properties.

Finally, findings from this research generalize only to mothers in treatment for substance use and therefore tests of mechanisms will need to be replicated with other treatment (and non-clinical) populations to determine whether these mechanisms are a population-specific phenomenon.

Implications for Future Research

Collectively, for mothers who are in addiction treatment, these findings point to the importance of maternal reflective functioning and mental representations of caregiving as core mechanisms for improving maternal sensitivity (directly) and attachment security (indirectly) in young children. Moreover, they point to the therapist's efforts to support a mother's growing capacity to mentalize about herself and her child as *an essential core component of MIO* for improving maternal representations (and the notable limitations of behavioral guidance and treatment alliance-building components). Going forward in a new community-based efficacy trial (currently ongoing), these findings indicate the importance of retaining and not altering the unique MIO components. At the same time, if MIO continues to demonstrate efficacy, it will be important to retest the mechanisms of change

using data from this new community-based randomized efficacy trial in order to know whether and how the intervention should be modified before the next stage, the implementation research phase.

Implication for Intervention

Limitations not withstanding, we now have evidence that targeting maternal mentalization and caregiving representations while mothers are enrolled in addiction treatment has potential direct benefits for the mother's parenting and indirect benefits for her child's attachment status. Continuing this line of research that focuses on amending addiction treatment with supplemental mentalization-based parenting therapy has the potential to strengthen treatment outcomes for parents. It is our hope that clinicians and researchers working with parents and adults in addiction treatment will continue to broaden the focus of available treatments to include this new promising approach.

Acknowledgments

References

Ainsworth, MDS., Blehar, MC., Waters, E., Wall, S. Patterns of attachment: A psychological study of the strange situation. Hillsdale, NJ: Erlbaum; 1978.

Allen, JG., Fonagy, P., Bateman, A. Mentalizing in clinical practice. 1. Arlington, VA: American Psychiatric Publishing; 2008.

Bateman, AW., Fonagy, P. Handbook of mentalizing in mental health practice. 1. Arlington, VA: American Psychiatric Publishing; 2012.

Bayley, N. Bayley Scales of Infant and Toddler Development Screening Test. 3. San Antonio, TX: Harcourt Assessment; 2006.

Bernard K, Dozier M, Bick J, Lewis-Morrarty E, Lindhiem O, Carlson E. Enhancing attachment organization among maltreated children: Results of a randomized clinical trial. Child Development. 2012; 83:623–636. [PubMed: 22239483]

Bretherton, I., Munholland, KA. Internal working models in attachment relationships: Elaborating a central construct in attachment theory. In: Cassidy, J., Shaver, PR., editors. Handbook of Attachment. New York: The Guilford Press; 2008. p. 102-127.

Burns KA, Chethik L, Burns WJ, Clark R. The early relationship of drug abusing mothers and their infants: An assessment at eight to twelve months of age. Journal of Clinical Psychology. 1997; 53:279–287. [PubMed: 9075056]

Cassidy, J., Marvin, RS., with the MacArthur Attachment Working Group. Attachment organization in preschool children: Coding guidelines. 4. Unpublished manuscript; University of Virginia: 1992.

Cassidy J, Woodhouse SS, Sherman LJ, Stupica B, Lejuez CW. Enhancing infant attachment security: An examination of treatment efficacy and differential susceptibility. Development and Psychopathology. 2011; 23:131–148. [PubMed: 21262044]

Choi S, Ryan J. Co-occurring problems for substance abusing mothers in child welfare: Matching services to improve family reunification. Children and Youth Services Review. 2007; 29:1395–1410.

Cohen, J., Cohen, P. Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, NJ: Erlbaum Associates; 1983.

Department of Health and Human Services. Blending perspectives and building common ground: A report to congress on substance abuse and child protection. Washington, DC: DHHS. Derogatis; 1999 Apr. 1993

DeCoste, C., Dalton, R., de las Heras Kuhn, L., Dennehy, L. Parent Education: An individualized psycho-educational program for mothers of children under 5 years of age. New Haven, CT: Yale University School of Medicine; 2010.

Derogatis, LR. Brief Symptom Inventory: Administration, scoring, and procedures manual. 3. Minneapolis, MN: National Computer Systems; 1993.

Diamond GM, Diamond GS, Hogue A. Attachment-based family therapy: Adherence and differentiation. Journal of Marital and Family Therapy. 2007; 33:177–191. [PubMed: 17437458]

Fals-Stewart W, O-Farrell TJ, Freitas TT, McFarlin SK, Rutigliano P. The Timeline Followback reports of psychoactive substance use by drug-abusing patients: Psychometric properties. Journal of Consulting and Clinical Psychology. 2000; 68:134–144. [PubMed: 10710848]

Feldman, R. Coding interactive behavior manual. Ramat Gan, Tel Aviv, Isreal: Bar-Ilan University; 1998.

Fonagy, P., Gergely, G., Jurist, E., Target, M. Affect regulation, mentalization, and the development of the self. New York: Other Press; 2002.

Fonagy P, Steele M, Steele H, Moran GS, Higgit AC. The capacity for understanding mental states: The reflective self in parent and child and its significance for security of attachment. Infant Mental Health Journal. 1991; 12:201–218.

Fonagy, P., Steele, M., Steele, H., Leigh, T., Kennedy, R., Mattoon, G., Target, M. Attachment, the reflective self, and borderline states: The predictive specificity of the Adult Attachment Interview and pathological emotional development. In: Goldberg, S.Muir, R., Kerr, J., editors. Attachment theory: Social, developmental, and clinical perspectives. Hillsdale, NJ: Analytic Press; 1995. p. 233-278.

Gottman JM, Rushe RH. The analysis of change: issues, fallacies, and new ideas. Journal of Consulting and Clinical Psychology. 1993; 61:907–910. [PubMed: 8113491]

Grant T, Huggins J, Graham JC, Ernst C, Whitney N, Wilson D. Maternal substance abuse and disrupted parenting: Distinguishing mothers who keep their children from those who do not. Children and Youth Services Review. 2011; 33:2176–2185.

Greenfield SF, Back SE, Lawson K, Brady KT. Substance abuse in women. Psychiatric clinics of North America. 2010; 33:339–355. [PubMed: 20385341]

Hans LL, Bernstein VJ, Henson LG. The role of psychopathology in the parenting of drug-dependent women. Development & Psychopathology. 1999; 11:957–977. [PubMed: 10624734]

Harrison PL, Kaufman AS, Kaufman NL, Bruininks RH, Rynders J, Ilmer S, Sparrow SS, Cicchetti DV. AGS Early Screening Profiles. Journal of Psychoeducational Assessment. 1990; 13:101–104.

Hoffman KT, Marvin RS, Cooper G, Powell B. Changing toddlers' and preschoolers' attachment classifications: the Circle of Security Intervention. Journal of Consulting and Clinical Psychology. 2006; 74:1017–1026. [PubMed: 17154732]

Hogue A, Henderson CE, Dauber S, Barajas PC, Fried A, Liddle HA. Treatment adherence, competence, and outcome in individual and family therapy for adolescent behavior problems. Journal of Consulting and Clinical Psychology. 2008; 76:544–555. [PubMed: 18665684]

Horvath AO, Symonds BD. Relation between working alliance and outcome in psychotherapy: A meta-analysis. Journal of Counseling Psychology. 1991; 38:139–149.

Jones, RG. Heroin's hold on the young. The New York Times. 2008 Jan 13. Retrieved from http://www.nytimes.com

Kerwin ME. Collaboration between child welfare and substance-abuse fields: Combined treatment programs for mothers. Journal of Pediatric Psychology. 2005; 30:581–597. [PubMed: 16166247]

Martin DJ, Garske JP, Davis MK. Journal of Consulting and Clinical Psychology. 2000; 68:438–450. [PubMed: 10883561]

Mayes L, Carter A, Stubbe D. Infant differences in exploratory behavior in the second year of life. Infant Behavior and Development. 1993; 16:269–284.

Moss E, Dubois-Comtois K, Cyr C, Tarabulsy GM, St-Laurent D, Bernier A. Efficacy of a home-visiting intervention aimed at improving maternal sensitivity, child attachment, and behavioral

outcomes for maltreated children: A randomized control trial. Development and Psychopathology. 2011; 23:195–210. [PubMed: 21262048]

Nock MK. Conceptual and design essentials for evaluating mechanisms of change. Alcoholism: Clinical and Experimental Research. 2007; 31:4S–12S.

Onken LS, Carroll KM, Shoham V, Cuthbert BN, Riddle M. Revisioning clinical science: unifying the discipline to improve the public health. Clinical Psychological Science. 2014; 2:22–44. [PubMed: 25821658]

Perepletchikova F, Kazdin AE. Treatment integrity and therapeutic change: Issues and research recommendations. Clinical Psychology: Science and Practice. 2005; 12:365–383.

Rogosa, DR. Myths and methods: "Myths about longitudinal research," plus supplemental questions. In: Gottman, JM., editor. The analysis of change. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1995. p. 3-65.

Rutherford HJV, Williams SK, Moy S, Mayes LC, Johns JM. Disruption of maternal parenting circuitry by addictive process: rewiring of reward and stress symptoms. Frontiers in Psychiatry. 2011; 2:37. [PubMed: 21779252]

Sadler LS, Slade A, Close N, Webb DL, Simpson T, Fennie K, Mayes L. Minding the baby: Enhancing reflectiveness to improve early health and relationship outcomes in an interdisciplinary home-visiting program. Infant Mental Health Journal. 2013; 34:391–405. [PubMed: 24049219]

Schafer JL, Graham JW. Missing data: Our view of the state of the art. Psychological Methods. 2002; 7:147–177. [PubMed: 12090408]

Seelye, KQ. Obituaries shed euphemisms to chronicle toll of heroin. The New York Times. 2015 Jul 11. Retrieved from http://www.nytimes.com

Slade A. Parental reflective functioning: An introduction. Attachment and Human Development. 2005; 7:269–281. [PubMed: 16210239]

Slade, A., Aber, JL., Berger, B., Bresgi, I., Kaplan, M. The Parent Development Interview – Revised. City University of New York: 2003. Unpublished manuscript

Slade A, Grienenberger J, Bernbach E, Levy D, Locker A. Maternal reflective functioning, attachment, and the transmission gap: A preliminary study. Attachment & Human Development. 2005; 7:283–298. [PubMed: 16210240]

Sobell, LC., Sobell, MB. Timeline Follow-Back: A technique for assessing self-reported alcohol consumption. In: Litten, RZ., Allen, J., editors. Measuring alcohol consumption: Psychosocial and biological methods. Totowa, NJ: Humana Press; 1992. p. 41-72.

Sobell, LC., Sobell, MB. Timeline Followback user's guide: A calendar method for assessing alcohol and drug use. Toronto, Ontario, Canada: Addiction Research Foundation; 1996.

Solomon, J., George, C. The measurement of attachment security in infancy and childhood. In: Cassidy, J., Shaver, PR., editors. Handbook of attachment: Theory, research, and clinical applications. 2. New York: The Guilford Press; 2008. p. 383-416.

Strathearn L. Maternal neglect: Oxytocin, dopamine and the neurobiology of attachment. Journal of neuroendocrinology. 2011; 23:1054–1065. [PubMed: 21951160]

Strathearn L, Fonagy P, Amico J, Montague PR. Neuropsycopharmacology. 2009; 34:2655–2666.

Suchman N, DeCoste C, Leigh D, Borelli J. Reflective functioning in mothers with drug use disorders: Implications for dyadic interactions with infants and toddlers. Attachment and Human Development. 2010; 12:567–585. [PubMed: 20931415]

Suchman NE, DeCoste CL, McMahon TJ, Dalton R, Mayes LC, Borelli J. Mothering from the Inside Out: Results of a second randomized clinical trial testing a mentalization-based intervention for mothers in addiction treatment. Development and Psychopathology. 2017; 29:617–636. [PubMed: 28401850]

Suchman N, DeCoste C, McMahon T, Rounsaville B, Mayes L. *The Mothers and Toddlers Program*, an attachment-based parenting intervention for substance-using women: Results at 6-week follow-up in a randomized clinical pilot. Infant Mental Health Journal. 2011; 32:427–449. [PubMed: 22685361]

Suchman, N., DeCoste, C., Ordway, M., Bers, S. Mothering from the Inside Out: A mentalization-based individual therapy for mothers with substance use disorders. In: Suchman, N.Pajulo, M.,

Mayes, L., editors. Parenting and substance addiction: Developmental approaches to intervention. NY: Oxford University Press; 2013. p. 407-433.

Suchman NE, DeCoste C, Rosenberger P, McMahon TJ. Attachment-based intervention for substance using mothers: A preliminary test of the proposed mechanisms of change. Infant Mental Health Journal. 2012; 33:360–371. [PubMed: 23024442]

Suchman NE, Pajulo M, DeCoste C, Mayes LC. Parenting interventions for drug dependent mothers and their young children: The case for an attachment-based approach. Family Relations. 2006; 55:211–226. [PubMed: 17417669]

Suchman, NE., Rosenberger, P., DeCoste, C. The Revised MIO/PE Therapist Adherence Rating Scale and Coding Procedures Manual. New Haven, CT: Yale University School of Medicine; 2010.

Toth SL, Rogosch FA, Manly JT, Cicchetti D. The efficacy of toddler-parent psychotherapy to reorganize attachment in the young offspring of mothers with major depressive disorder: A randomized preventive trial. Journal of Consulting and Clinical Psychology. 2006; 74:1006–1016. [PubMed: 17154731]

Webster-Stratton, C., Reid, MJ. The Incredible Years parents, teachers and children training series: A multifaceted treatment approach for young children with conduct problems. In: Weisz, J., Kazdin, A., editors. Evidence-based psychotherapies for children and adolescents. 2. New York: Guilford Publications; 2010. p. 194-210.

Zeanah CH, Benoit D. Clinical applications of a parent perception interview in infant mental health. Infant Psychiatry. 1993; 3:539–554.

- Improvement in maternal reflective functioning and caregiving representations led to improvement in maternal caregiving sensitivity.

- Improvement in maternal caregiving sensitivity was associated with improvement in child attachment security.

- Therapist fidelity to promoting maternal reflective functioning led to improvement in maternal reflective functioning.

Table 1

Descriptive Data (n = 84)

Maternal demographic factors	Mean (SD) or Percent
Age	29.90 (5.29)
Education (years)	12.44 (2.18)
Employed	20.0
Public assistance	96.4
Race/Ethnicity	
Caucasian	78.6
African American	13.1
Hispanic/Latina	3.5
Other	4.8
Marital status	
Never married	40.5
Cohabitating	35.7
Married	14.3
Divorced	7.1
Separated	2.4
Domicile	
Independent	60.7
Dependent [a]	35.7
Homeless	3.6
Minor children in their care	1.67 (.99)
DCF-involved (at baseline)	31.0
Primary substance	
Heroin/opioids	84.5
Alcohol	6.0
Cocaine	3.6
PCP	3.6
Cannabis	2.3
Opiate replacement	
Methadone	73.0
Buprenorphine-naloxone	13.0
Target child's father characteristics	
Age	34.37 (7.50)
Living at home	46.4
Employed	63.0
History of substance use	76.0
Target child characteristics	
Age (months)	27.92 (14.88)
Male	54.0

Maternal demographic factors	Mean (SD) or Percent
Living with mother	96.4
Developmentally at risk	
Ages 11 – 36 months (n = 40) Cognitive	15.0
Receptive communication	24.3
Expressive communication	16.2
Ages 37 – 60 months (n = 19) Cognitive/language	5.3

[a] Living in the home of a family member or supervised housing

Table 2

Descriptive data for all variables

	Baseline	Post-treatment			3 month follow up		
	Mean (SD)	Mean (SD)	Difference (T2 – Baseline) Mean (SD)	Range	Mean (SD)	Difference (T3 – Baseline) Mean (SD)	Range
Psychiatric Distress	60.37 (10.06) [a]	55.91 (10.47) [a]	−4.45 (8.86)	−36.00 – 15.00	-	-	-
Reflective Functioning							
Self-focused	2.94 (.65)	2.98 (.61)	.04 (.65)	−1.50 – 1.50	-	-	-
Child-focused	3.18 (.59)	3.32 (.55)	.15 (.54)	−1.60 – 1.20	-	-	-
Mental representations of caregiving	2.54 (.37)	2.64 (.37)	.10 (.31)	−1.00 – 1.00	-	-	-
Maternal Sensitivity	3.50 (.78)	3.49 (.78)	−.02 (.55)	−1.50 – 1.92	3.44 (.76)	−.06 (.65)	−2.00 – 1.67
	Percent	Percent			Percent		
Substance Use	46	31	−15		25	−21	

	Percent	
Child attachment	Baseline	Post-treatment
Secure	57.1	58.1
Insecure	21.5	35.5
Disorganized	21.4	6.5

Percent at Post-treatment		
Less Secure	No change	More secure
16.9	67.8	15.3

[a] T-Scores (Derogatis, 1993)

Table 3

Results of hierarchical regression analyses testing treatment fidelity as a predictor of change in maternal reflective functioning and mental representations of caregiving

	Step	Change in Reflective Functioning — Self-focused R²	βᵃ	Child-focused R²	βᵃ	Change in Mental Representations of Caregiving R²	βᵃ
Covariates	1	.14*		.07*		.02	
Child age		.04	−.20	.04	−.21	.01	−.12
Child gender		.00	.04	.00	−.05	.01	−.10
Maternal education		.11*	−.34	.03	−.19	.00	.02
Treatment Fidelity	2	.03		.01		.01	
Alliance building		.00	−.06	.01	−.09	.00	−.07
Behavioral guidance		.02	.16	.00	.04	.01	−.08
	3	.10*		.00		.31*	
Self-focused mentalizing		.05*	.30	.00	−.08	.11*	.42
Child-focused mentalizing		.00	.06	.00	.02	.03	.23

[a] Standardized weights

* meets study criteria for rejection of null hypothesis ($R^2 \geq .05$)

Table 4

Results of hierarchical regression analyses testing post-treatment change maternal reflective functioning and mental representations as predictors of change in maternal sensitivity at 3 month follow up

	Step	R^2	Change in Maternal Sensitivity (Follow up)	
Covariates	1	.06 [*]	R^2	β [a]
Child age			.00	−.06
Child gender			.03	.16
Maternal education			.02	.15
Post-treatment change in…	2	.01		
Psychiatric distress			.00	.06
Substance use			.00	.08
Post-treatment change in…	3	.08 [*]		
Reflective functioning				
Self-focused			.00	.01
Child-focused			.02	.14
Mental representations of caregiving			.04	.22

[a] Standardized weights

[*] meets study criteria for rejection of null hypothesis (R^2 .05)

Table 5

Results of ordinal regression analysis testing predictors of improvement in child attachment security (n=59)

Covariates	Estimate	Odds Ratio	Confidence Interval (95%)	
			Lower	*Upper*
Child age	−.03	.97	.93	1.02
Child gender	.37	1.44	.45	4.59
Maternal education	.01	1.01	.77	1.32
Post-treatment change in…				
Psychiatric distress	.01	1.01	.96	1.07
Substance use	.44	1.56	.39	6.20
Post-treatment change in…				
Reflective functioning				
Self-focused	.69	2.00	.76	5.22
Child-focused	−.88	.41	.13	1.28
Mental representations of caregiving	−.16	.85	.15	4.80
Maternal sensitivity	1.28*	3.61*	1.35	9.64

*
null hypothesis rejected

Table 6

Results of hierarchical regression analyses testing post-treatment change in maternal reflective functioning and mental representations of caregiving as predictors of change in substance use at 3 month follow-up (n = 70)

	Step	R^2	Change in Substance Use (Follow up)	
			R^2	β^a
Covariates	1	.03		
Child age			.03	−.17
Child gender			.01	−.08
Maternal education			.00	−.04
Post-treatment change in…	2	.01		
Psychiatric Distress			.01	−.12
Post-treatment change in…	3	.03		
Reflective functioning				
Self-focused			.02	.15
Child-focused			.03	−.18
Mental representations of caregiving			.00	.04

[a]Standardized weights