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## ATTACHMENT-BASED INTERVENTION FOR SUBSTANCE- USING MOTHERS: A PRELIMINARY TEST OF THE PROPOSED MECHANISMS OF CHANGE

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### Abstract

Although randomized controlled trials examining the efficacy of attachment-based interventions have been increasing in recent years, adequate measurement of treatment integrity, integrity–outcome associations, and mechanisms of change has been rare. The aim of this investigation was to conduct a rigorous test of proposed mechanisms of change in the Mothers and Toddlers Program (MTP) treatment model, a 12-session, attachment-based individual therapy for substance-using mothers of children birth to 3 years of age. The MTP aims to improve maternal reflective functioning (RF) and representation quality (RQ) to bring about second-order change in maternal caregiving behavior. Following guidelines from M.K. Nock (2007), it was hypothesized that (a) therapist adherence to unique MTP treatment components would uniquely predict improvement in RF and RQ and that (b) improvement in RF and RQ would function as unique mechanisms of change (when compared with other potential mechanisms—reduction in depression and increase in abstinence from drug use) in the improvement of caregiving behavior. Findings supported each hypothesis, confirming the proposed mechanisms of the treatment model. However, improvement in maternal depression also uniquely predicted improvement in caregiving behavior. Results underscore the potential value of attachment-based parenting interventions for improving mother–child relations and the importance of providing these interventions in clinic settings where mothers have access to comprehensive care (e.g., psychiatric services).

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Randomized controlled trials examining the efficacy of attachment-based interventions have been increasing in recent years (e.g., Cassidy, Woodhouse, Sherman, Stupica, & Lejuez, 2011; Levy et al., 2006; Moss et al., 2011; Toth, Rogosch, Manly, & Cicchetti, 2006; van Zeijl et al., 2006). However, with one exception (see Diamond, Diamond, & Hogue, 2007), adequate measurement of treatment integrity and integrity–outcome associations has been rare. Steps taken to monitor treatment fidelity have generally been limited to (a) using a treatment manual with specific goals and activities, (b) providing ongoing clinical supervision, (c) reviewing videotaped sessions and providing feedback, (d) encouraging

clients to make up missed sessions, and (d) choosing therapists with proven track records of adherence (Hoffman, Marvin, Cooper, & Powell, 2006; Levy et al., 2006). Without direct measures of treatment integrity (showing that treatment was delivered as intended), it is impossible to conduct a fair test of an attachment-based intervention (Perepletchikova, Treat, & Kazdin, 2007). Although intervention research has examined some factors (e.g., maternal sensitivity) associated with treatment outcome (e.g., attachment status; see Egeland, Weinfield, Bosquet, & Cheng, 2000), mechanisms of change that include treatment process have received limited attention.

## RECENT RECOMMENDATIONS FOR MEASURING TREATMENT INTEGRITY AND TESTING MECHANISMS OF CHANGE

Studies that have examined treatment integrity and mechanisms of action in attachment-based models may be scarce due to methodological challenges involved in measuring treatment integrity and establishing and isolating integrity–outcome associations (see Hogue et al., 2008; Nock, 2007; Perepletchikova & Kazdin, 2005; Perepletchikova et al., 2007). In a recent evaluation of procedures used to evaluate treatment integrity in 147 randomized controlled trials testing psychosocial interventions published in top-tier journals, Perepletchikova et al. (2007) concluded that only 3.5% employed adequate methods for measuring treatment integrity (15% of the interventions targeted parents or families). In addition to clearly defining the intervention, identifying critical practices, and providing direct and ongoing supervision, Perepletchikova et al. (2007) made a strong case for establishing reliable instruments for (a) measuring therapist fidelity, (b) intervention discrimination, (c) training adherence raters to recognize subtle nuances of treatment, and (d) collecting adherence data from a large representative sample.

Research on integrity–outcome associations also has been plagued by methodological problems of isolating unique therapeutic components responsible for behavior change and disentangling treatment, therapist, and client characteristics from the unique effects of treatment components on outcome (see Hogue et al., 2008; Perepletchikova & Kazdin, 2005). Moreover, most investigations of mechanisms of action have relied on simple tests of mediation to confirm therapeutic mechanisms of influence (Nock, 2007). Nock (2007) suggested that in addition to examining whether proposed mechanisms meet criteria for simple mediation, tests of mechanisms of change ought to be strengthened by examining (a) whether specific proposed treatment components (when compared with universal treatment components) are uniquely related to specific mechanisms and (b) whether specific proposed mechanisms of change (when examined together with alternative mechanisms) are uniquely associated with change in specified outcomes.

## RESEARCH IMPLICATIONS

The case for attachment-based interventions with high-risk populations could therefore be strengthened with evidence that (a) intervention delivery resembles the proposed attachment-based model and is easily distinguished from other treatment approaches, (b) unique treatment components (when compared with generic treatment components) of the attachment-based intervention account for improvement in specified attachment-related outcomes, and (c) specific mechanisms of change proposed in attachment-based interventions (when compared with other potential mechanisms of change) account for improvement in specified attachment-related outcomes.

## AIMS OF THE CURRENT STUDY

In a recently completed, randomized controlled pilot study testing the preliminary efficacy of the Mothers and Toddlers Program (MTP) in comparison to a parent-education control, MTP showed considerable promise for improving primary targeted outcomes [maternal reflective functioning (RF) and representation quality (RQ)] and a secondary targeted outcome (caregiving behavior) at the end of 12 weeks and at the 6-week follow-up (for a complete report, see Suchman et al., 2010; Suchman, DeCoste, McMahon, Rounsaville, & Mayes, 2011). The aim of the current investigation was to conduct a preliminary test of the proposed mechanisms of change in the MTP treatment model. The MTP model is based on the attachment-based premise that improvement in maternal capacity for RF and RQ (primary targeted outcomes) will (a) occur in response to therapeutic intervention targeting these two specific capacities and (b) serve as unique mechanisms of change that will lead to improvement in maternal caregiving behavior (the secondary targeted outcome) and, ultimately, child attachment status.

## THE MTP

The MTP is a manual-guided, 12-session, weekly individual therapy that aims to foster improvement in the quality of relationships between mothers with substance-use disorders and their young children (ages birth to 3 years). Based on the principles of attachment, the intervention aims to improve mothers' RF (the capacity to recognize intentions and emotions underlying interactions with their young child) and modify distorted (e.g., unrealistic, exaggerated, overly idealizing or denigrating, or oversimplified) or occluded (e.g., impoverished or absent) representations of the child and the caregiving relationship. Together, these capacities for RF and RQ are thought to play an important role in a caregiver's sensitive response to young children's emotional cues, formation of secure parent-child attachments, and young children's growing capacity for emotional regulation (Fonagy, Gergely, Jurist, & Target, 2002; Slade, 2005; Sroufe, Egeland, Carlson, & Collins, 2005).

## Proposed Treatment Components and Targeted Outcomes

The three unique treatment components that are thought to distinguish MTP from other parenting interventions are (a) a focus on maternal RF, (b) a focus on improving the quality of maternal representations of the relationship with the child, and (c) provision of attachment-based developmental guidance. To effectively deliver the unique treatment components, however, it is necessary to establish a strong therapeutic alliance with mothers, quickly address their difficulties with emotional containment, and provide developmental guidance about child safety and developmental capacities (e.g., cognitive, language, and motor). These three additional treatment components (fostering a secure alliance, fostering emotional containment, and providing general developmental guidance) are considered generic components of any parenting intervention, and are not unique to MTP. Therefore, we hypothesized that:

**H1:** When the unique and generic components of MTP were examined together (and when other potential mechanisms of change were held constant as described later), therapist fidelity to the unique MTP components would be uniquely associated with improvement in (a) maternal RF and RQ (primary outcomes) and (b) maternal caregiving behavior (secondary outcome).

## Proposed Mechanisms of Change

From an attachment perspective (Fonagy et al., 2002; Sroufe et al., 2005), improvement in RF and RQ are together thought to function as a unique mechanism of change (at the representational level) in relation to caregiver sensitivity and responsiveness to child cues, even when examined in conjunction with other potential mechanisms of change. That is, when the therapeutic focus on RF and RQ leads to improvement in caregiving behavior (at the behavioral level), this change is thought to be due largely to improvement in RF and RQ (and not other competing mechanisms). However, there are other potential mechanisms of change in parenting interventions for substance-using mothers, including (a) reduction in depression and (b) increase in abstinence from substance use. It is conceivable that the intervention might provide an indirect benefit for maternal depression and substance use that might, in turn, correspond to improvement in caregiving behavior (Goodman & Gotlib, 1999; Haggerty, Skinner, Fleming, Gainey, & Catalano, 2008). Therefore, we hypothesize that:

**H2:** When all possible mechanisms of change (e.g., improvement in RF and RQ, reduction in depression, and increase in abstinence) are examined together, improvement in RF and RQ will demonstrate a unique association with improvement in caregiving behavior.

**H3:** When all possible mechanisms of change are tested simultaneously as potential explanatory mechanisms linking fidelity to unique MTP components with improvement in caregiving behavior, only improvement in RF and RQ will meet all criteria as the explanatory mechanism. That is, improvement in RF and RQ will (a) be uniquely predicted by therapist adherence to unique MTP components (H1), (b) uniquely predict improvement in caregiving behavior (H2), and (c) explain a significant proportion of the formerly significant relationship between therapist adherence to unique MTP components and caregiving behavior (see Nock, 2007).

## METHOD

### Study Design

The purpose of this randomized pilot study was to conduct a preliminary test of the efficacy of the MTP, a weekly individual therapy, in comparison with the Parent Education (PE) intervention. Both interventions were provided as adjuncts to standard outpatient substance-abuse care. Mothers completed assessments at baseline, posttreatment, and 6-week follow-up. Mothers and children also completed interaction assessments at these same intervals (for a complete report on the randomized pilot study, see Suchman et al., 2010; Suchman et al., 2011).

### Recruitment, Informed Consent, and Randomization

All mothers enrolled in outpatient substance-use treatment and caring for a child between birth and 36 months of age were eligible to participate. Mothers who were actively suicidal, homicidal, severely cognitively impaired, disengaged from their substance-use treatment, or not fluent in English were excluded from participating. Mothers were recruited via clinician referrals, research staff visits to clinic groups and medication lines, and self-referral. Mothers were screened for eligibility upon first contact with the research coordinator, who also confirmed eligibility with the mother's clinician. Eligible mothers were scheduled to meet with the research coordinator during the same week to complete informed-consent procedures. During consent procedures, mothers were informed that after completing a baseline assessment, they would be randomly assigned to one of two parenting programs designed to assist them in managing parenting stress. Mothers were asked permission to access their clinic attendance records and urine toxicology (UTOX) screen results (routine

screenings of urine samples for drug metabolites) over the course of the study. A certificate of confidentiality was obtained to protect the confidentiality of all research records.

## Sample

Of 56 mothers who consented to participate, 47 completed baseline measures and were randomized to 12 individual weekly sessions (23 MTP, 24 PE). Adherence ratings for this study included ratings from all sessions completed by the 19 mothers who completed MTP and all sessions from a random sample of 5 mothers who completed PE. Analyses reported in this study contained data from the MTP group (192 sessions) and the PE group ( $n = 23$ ). We oversampled adherence ratings from the MTP mothers' sessions to insure that the items captured major components the MTP intervention across clients, clinicians, and sessions. We collected a smaller sample of ratings from sessions completed by a random sample of PE mothers to determine if (a) adherence to generic components was as expected and (b) adherence to MTP-specific components was significantly different from the MTP sessions.

Demographic characteristics of the total sample of 24 mothers (19 MTP, 5 PE) are reported in Table 1. Because occupational status of women and adults with substance-use disorders is not a reliable indicator of socioeconomic status due to fluctuations in employment (for a discussion, see Hoff-Ginsberg & Tardif, 1995; Suchman & Luthar, 2001), maternal education level was used as a proxy for socioeconomic status.

## MTP Therapist Training

MTP therapists were selected based on their clinical experience working with similar populations and their willingness and capability to adopt a reflective stance with the patients. Four therapists (two master's-level and two doctoral-level clinicians) provided MTP treatment for the study. Therapists received extensive training in the treatment model prior to the study and weekly supervision throughout the duration of the study from the Principal Investigator (first author). The MTP clinical team met bimonthly with a co-investigator (last author) specializing in infant development to review tapes of mother-child interactions. MTP therapists also completed Treatment Fidelity Scales after each session and received ongoing feedback on treatment fidelity ratings conducted by independent raters.

## PE

The comparison intervention (PE) was designed to match MTP on the generic treatment components. Mothers in the PE condition met weekly with a parent educator, who worked to form a secure alliance with the mother by being supportive, reflecting the mother's point of view, accepting and normalizing the mother's experiences, and assisting the mother with solving problems and resolving crises (including getting connected to services). The parent educator also provided psychoeducational pamphlets on parenting topics of the mothers' choosing that provided general and age-appropriate developmental guidance. Examples of infant topics included soothing a crying baby, managing bedtime routines, and establishing routines and rituals. Examples of toddler topics included helping toddlers dress, managing bedtime battles, managing difficult behavior in public, and setting limits without using punishment. The pamphlets targeted readers at a Grade-5 reading level and were limited to two to three pages in length. Mothers met with the parent educator weekly for 1 hr for a duration of 12 weeks.

## Outpatient Substance-Use Treatment

The MTP and PE were conducted on site at the substance-abuse treatment clinic where mothers enrolled in the study received substance-abuse treatment. As part of their ongoing substance-use treatment, mothers had access to group cognitive-behavioral therapy,

psychiatric services, substance replacement therapy (e.g., methadone, naltrexone, and suboxone), medical care, vocational counseling, childcare, transportation to the clinic, and ongoing assistance with basic needs (e.g., housing, education, food, legal aid, state and city welfare, and other entitlements). Treatment at the outpatient clinic was paid for by patients' individual insurance or by the patients themselves (with payments based on a sliding fee scale).

### Assessments and Measures of Treatment Outcome

**Treatment fidelity**—The MTP Treatment Fidelity Scales and Coding Manual (Suchman, Rosenberger, & DeCoste, 2006) were developed and piloted during this study to (a) measure the unique components of the MTP intervention, (b) determine if therapists in both conditions (MTP and PE) were adhering to generic components, and (c) determine if therapists differed significantly by condition (MTP vs. PE) in adherence to the unique MTP components. The initial 24-item binary scale contained 14 items representing the three unique MTP components (fostering RF and RQ, and providing attachment-based developmental guidance) and 10 items representing the generic components common to the MTP and PE (fostering a secure alliance and emotional containment, and providing general developmental guidance). Two items from the original scale that were rarely endorsed were eventually omitted.

To test interrater reliability for each subscale, two scale developers (the Project Director and a Ph.D.-level clinical psychologist who was blind to all aspects of the study except the MTP intervention model) independently coded 37 videotaped MTP sessions conducted by three therapists. Interclass correlations were calculated for the two raters' scores on each of the six domains [Intraclass correlations (ICCs) were used because they take variance due to subject, session, and rater into account. The threshold for acceptable ICCs is generally lower than that for Pearson correlations; see Shrout & Fleiss, 1979]. Scales with acceptable ICCs ( $.50$ ) were retained in the final measure (see Suchman et al., 2010).

Once the 22-item scale was finalized (see Tables 2 and 3), the Ph.D. psychologist who was blind to information about the mothers rated 153 additional MTP sessions and 23 PE sessions from 5 randomly selected participants. Adherence ratings from 190 MTP and 23 PE sessions were then available for all subsequent analyses. For each session, the proportion of items endorsed on each of the six subscales was computed (see Tables 2 and 3). As shown in Tables 2 and 3, therapist fidelity to the three essential-but-not-unique MTP components ranged from 35 to 74% for MTP therapists and from 22 to 65% for the PE therapists. Therapist fidelity to the three unique MTP components ranged from 35 to 43% for the MTP therapists and from 20 to 27% for the PE therapists.

Treatment discrimination was assessed in one-way analyses of variance comparing the MTP and PE scores for each of the three unique MTP components after controlling for therapist assignment. Mean scores differed significantly across groups (MTP vs. PE) for Internal Working Model,  $F= 3.74$ ,  $p < .05$ , and RF,  $F= 9.25$ ,  $p < .006$ , and marginally for Developmental Guidance about Attachment,  $F= 2.81$ ,  $p < .10$ .

For this investigation, two composite scales were used to represent generic and unique treatment components, respectively. Generic components represented the intervention approach used in both the MTP and PE. Unique components represented the intervention approach used in the MTP only. The Generic Composite Scale was computed by summing the scores for three subscales: Fostering Secure Alliance, Fostering Emotional Regulation, and Providing General Developmental Guidance. The Unique Composite Scale was computed by summing the scores for three subscales: Fostering Reflective Functioning, Fostering Relationship Quality, and Providing Attachment-Based Developmental Guidance.



**Psychosocial evaluation**—The psychosocial evaluation was used to characterize the treatment sample at baseline. Mothers completed the 1 1/2-hr structured interview conducted by a clinically trained research assistant during the baseline visit. During the interview, mothers were asked about family demographic information, developmental history, substance use and psychiatric history (including during pregnancy), family substance use and psychiatric history, medical history, legal involvement, employment history, and reasons for seeking help with parenting. Information from this interview was used to establish primary substance-use and psychiatric diagnoses and to identify baseline demographic and psychosocial characteristics of the sample.

**RF**—The Parent Development Interview (PDI; Slade, Aber, Berger, Bresgi, & Kaplan, 2002) was used to measure the mother's capacity to mentalize about her own and her child's behavior. The PDI is a 1-hr semistructured interview that contains 17 questions designed to elicit the mother's narrative about commonly occurring, emotionally challenging aspects of parenting (e.g., times when parent and her child were not getting along, when parent felt angry, needy, or guilty as a parent, or when parent felt child needed attention) that typically pull for mentalization. The interviewer uses specific probes when asking the mother to consider her own and her child's internal experiences during these interactions and how these internal experiences might have affected the child.

The PDI interview was digitally recorded and transcribed. Transcriptions were coded by a Ph.D. psychologist who was trained to reliability (e.g., interclass correlations  $\geq .50$  for each item on 15 independently rated protocols) by the PI (who was trained to reliability by Dr. Slade, the measure author) and remained blind to treatment assignment and all other information about mother-child dyads during the study. Responses to each question were rated on a 10-point scale representing the level of RF exhibited by the mother in her response (These coding methods were originally developed by Fonagy, Target, Steele, & Steele, 1998, for use with the Adult Attachment Interview; Main & Goldwyn, 1995, and then adapted for use with the PDI by Slade, Bernbach, Grienberger, Levy, & Locker, 2005). A rating of 1 indicates a complete absence of any recognition of mental states (i.e., events are described solely in terms of behavior and individuals solely in terms of global personality traits). A rating of 3 indicates a limited capacity to acknowledge mental states without any understanding of how mental states function. A rating of 5 indicates the presence of a rudimentary capacity for RF—or basic understanding of how mental states work together and influence behavior. A rating above 5 indicates an increasingly elaborate and sophisticated understanding of how mental states function and influence behavior. The mean score for the 17 items was used to measure the mother's overall RF.

**Mental representations of the child**—The Working Model of the Child Interview (WMCI; Zeanah & Benoit, 1993) was used to assess the quality of the mother's representations of the child and the caregiving relationship. The WMCI is a 1 1/2-hr semistructured interview designed to elicit a narrative description of the mother's perceptions of her child and their relationship. The WMCI is intended for use with parents of children ages birth to 5 years. The interview included inquiries about the parent's perceptions of the child's distinctive characteristics and characteristics of the caregiver's relationship with the child, particularly during times when the child's attachment needs are likely to be activated (e.g., recent times when the child is upset, physically or emotionally hurt, exhibiting difficult behaviors, or separated from the mother). The interview was conducted by a clinically trained research assistant who used specific probes (e.g., When is the last time that happened?) to insure that the narrative was adequate for coding.

The interview was digitally recorded and then coded by a Ph.D. psychologist who was trained to reliability by the PI (interclass correlations  $\geq .50$  for items on 15 independently

rated protocols) and was blind to treatment assignments and all other information and assessments about mother–child dyads across the study. The PI was originally trained to code the WMCI by the measure’s author using the three-part classification system; however, the three-part classification system ordinarily used with this instrument (Zeanah & Benoit, 1993) did not have the sensitivity necessary to detect small, but meaningful, shifts in representational quality. The six qualitative scales used to arrive at overall classification were therefore used instead as a specific adaptation for this study. The rater was therefore trained by the PI to code six qualitative subscales rated on a 5-point scale (1 = *not at all*, 3 = *moderate*, 5 = *extreme*) that together represent the most important representational qualities (Zeanah & Benoit, 1993). These characteristics include: *Richness* (attentiveness to child’s preferences and characteristics and sense of knowing child in some essential way), *Openness* (receptiveness to change in light of new information about the child and new discoveries about the child), *Coherence* (organization, logical flow, understandable, absence of contradiction or confusion), *Caregiving Sensitivity* (recognition of toddler’s physical and emotional needs and experiences), *Acceptance* (subordinating own needs to child’s, accepting child’s striving for independence), and *Intensity of Involvement* (psychological preoccupation, immersion in the relationship). On the six subscales, a score of 3 is considered to represent average representational quality, a score lower than 3 is considered to represent clinical risk, and a score above 3 is considered to represent optimal quality. High scores on the Intensity of Involvement subscale can indicate both positive and negative preoccupation. In this sample, high scores typically indicated positive emotional involvement and concern, and negative scores indicated indifference and emotional coolness. For the six scales, the interclass correlations achieved by the rater with the PI on 21 training tapes ranged from .50 to .60.

**Caregiving behavior**—The Nursing Child Assessment Satellite Training Teaching Scale (NCAST) Teaching Scales (Barnard & Eyres, 1979) were used to measure maternal caregiving behavior with the child. The NCAST is a widely used, standardized, 73 binary-item tool used to observe and rate quality of caregiver–child interactions with children ages birth to 36 months. Mothers are asked to choose one task to teach the child (e.g., holding a rattle, following rattle with gaze, reaching for rattle, transferring object from one hand to another, turning a page in a book, playing pat-a-cake, pretending to drink from a cup, stringing beads, drawing shapes, grouping blocks by color, etc.) from a list of tasks that are organized in increasing order of difficulty. The teaching session lasts 5 min.

The teaching sessions were digitally recorded using two remotely controlled cameras that captured close-up and wide-angle views of mother and child on a split screen. The sessions were coded by a certified NCAST rater who was trained according to NCAST requirements to 90% reliability by the Project Director (an NCAST-certified instructor) and remained blind to treatment assignment and all other information about the mother–child dyads. Maternal behavior during the teaching task was coded on four behavioral dimensions measured by the 11-item Sensitivity to Cues subscale (ability to accurately read cues given by the child), the 11-item Response to Distress subscale (ability to recognize and alleviate the child’s distress), the 11-item Social-Emotional Growth Fostering subscale (ability to affectionately initiate play and social interactions and provide appropriate social reinforcement), and the 17-item Cognitive Growth Fostering subscale (ability to provide stimulation which is just above the child’s current level of understanding). The Total Caregiver Score equals the sum of the four subscale scores. Each of the four maternal subscales contains a subset of items that are coded based on the contingency of the mother’s response to the child (e.g., whether the mother’s response to the child occurs within 5 s of the child’s cue).



**Maternal depression**—Although maternal psychiatric symptoms were not a primary targeted outcome, group differences (MTP vs. PE) in depression and global psychiatric distress were examined to identify possible indirect treatment effects. The Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996) was used to assess maternal symptoms of depression. The BDI is a widely used, 21-item questionnaire rated on a 4-point scale. The BDI yields a total score for depression ranging from 0 to 63; scores between 13 and 19 indicate mild depression; scores between 20 and 28 indicate moderate levels of depression, and scores between 29 and 63 indicate severe levels of depression (Beck et al., 1996).

**Maternal drug use**—Although maternal drug use was not a primary targeted outcome for this study, we examined group differences (MTP vs. PE) in substance use to identify possible indirect treatment effects. Maternal substance use was monitored using results from weekly UTOX screens testing for presence of opiate, cocaine, and cannabis metabolites in urine samples collected at the outpatient clinic. For each month of the mother's participation in the study, beginning with Month 0 (the month prior to consent) and continuing through the end of the posttreatment assessment (Month 8), a mother received a score of "0" if no drug metabolites were present in any of her urine toxicology screens during that month or a score of "1" if one or more of her urine toxicology screens tested positive for a drug metabolite during that month. Thus, mothers received a score of "0" or "1" for each month of enrollment in the study.

## Data Analysis

**Measurement of change**—Residual variance remaining after baseline scores were regressed on posttreatment was used to represent change in all outcomes (e.g., RF, RQ, caregiving behavior, depression, and substance use) from baseline to posttreatment. This method provides a reliable estimate of change that is not affected by correlations between scores across time points (for a detailed discussion on measuring change, see Cohen & Cohen, 1983, pp. 413–425).

**Data reduction**—Standardized residuals representing change in RF and RQ were summed to yield a composite standardized residual representing change in Overall RQ (The posttreatment RF and representation scores were significantly correlated,  $r = .41$ ,  $p < .05$ ). This construct represented overall change at the representational (vs. behavioral) level. This computation helped reduced experiment-wise error.

In two multiple linear regression analyses conducted for change in (a) Overall RQ and (b) Total Caregiving Behavior, respectively, after controlling for maternal education, child age, therapist assignment, number of sessions attended (Step 1), and other potential mechanisms of change (e.g., change in depression and substance use) (Step 2), scores for therapist fidelity to generic and unique treatment components were entered into the equation (Step 3). If adherence to the unique MTP elements predicted unique variance in change in (a) Overall RQ and (b) Total Caregiving Behavior such that greater adherence to unique MTP elements was associated with greater improvement in (a) and (b), H1 was accepted.

In a multiple linear regression analysis, after controlling for potential confounds (Step 1), standardized residuals representing change in Overall RQ, depression, and substance use were entered simultaneously (Step 2). If change in Overall RQ explained unique variance in change in Total Caregiving Behavior such that greater improvement in representations corresponded to greater improvement in caregiving behavior, H2 was accepted.

Acceptance of H1 and H2 will mean that all necessary conditions of mediation will have been met (Nock, 2007). That is, if H1 is correct, then the independent variable (therapist

adherence to unique MTP components) predicted significant improvement in the mediator (improvement in Overall RQ) and the dependent variable (caregiving behavior), respectively. If H2 is correct, then the mediator (improvement in Overall RQ) predicted significant improvement in the dependent variable (caregiving behavior). To test whether change in Overall RQ serves as a mechanism of change, in a multiple regression analysis, after controlling for potential confounds (Step 1), all potential mechanisms of change (e.g., change in RQ, depression, and substance use) were entered simultaneously (Step 2). Scores for therapist adherence to unique and generic MTP components were then entered (Step 3). If the association between therapist adherence to unique MTP components and change in caregiving behavior was diminished with change in Overall RQ added in Step 2, H3 was accepted.

## RESULTS

### H1: Treatment Fidelity–Outcome Associations

As shown in Table 4, after controlling for potential confounding factors (education, child age, therapist assignment, and number of sessions attended), alternative mechanisms of change (e.g., change in depression and substance use), and therapist adherence to generic (fostering secure alliance and emotional containment, and general developmental guidance), therapist adherence to unique MTP components (fostering RF and RQ, and providing attachment-based developmental guidance) predicted 27% of unique variance in improvement in Overall RQ ( $p < .05$ ) and 13% of unique variance in improvement in maternal caregiving behavior ( $p < .05$ ). Beta weights indicated that greater adherence to the unique MTP components corresponded to greater improvement in Overall RQ and Total Caregiving Behavior.

### H2: Potential Mechanisms of Change and Caregiving Behavior

After controlling for potential confounds, and alternative mechanisms of change (e.g., change in depression and substance use), 8% of unique variance in improvement in Total Caregiving Behavior was explained by change in Overall RQ ( $p < .05$ ), and 18% of unique variance was explained by change in depression ( $p < .05$ ). Beta weights indicate that greater improvement in Overall RQ and greater reduction in depression, respectively, corresponded to greater improvement in Total Caregiving Behavior.

### H3: Test of Mechanisms of Change

After controlling for potential confounds (e.g., maternal education, child age, therapist assignment, and number of sessions attended), alternative mechanisms of change (e.g., change in depression and substance use), and therapist adherence to generic MTP components, therapist adherence to unique MTP elements predicted 13% unique variance in change in Total Caregiving Behavior ( $p < .05$ ) before change in Overall RQ was added to the regression equation as a mechanism of change, and 4% unique variance in Overall RQ (n.s.) after change in Overall RQ was entered into the regression equation. This finding suggests that 69% of the predicted variance in change in Total Caregiving Behavior originally explained by therapist adherence to unique MTP components was explained by the hypothesized mechanism of change—improvement in Overall RQ.

## DISCUSSION

The aim of the current investigation was to examine the proposed mechanisms of change in the MTP, an attachment-based individual therapy for mothers in treatment for substance-use disorders and caring for children between birth and 3 years of age. In a recently completed

randomized clinical pilot study, the MTP showed preliminary promise for improving maternal RF, RQ, and caregiving behavior (see Suchman et al., 2010; Suchman et al., 2011).

Findings from the current study supported the first hypothesis that therapist fidelity to the unique and essential MTP practices of fostering improvement in maternal RF and RQ led to notable improvement in each of these domains as well as maternal caregiving behavior. In other words, the therapist's efforts to help mothers tease apart underlying emotional needs and intentions driving their own and their children's behavior, explore representations that might be limited or distorted, and understand children's behavior from an attachment perspective led to greater improvement in RF, RQ and caregiving behavior. This finding also suggests a possible dose-response relationship in that more of the treatment dose led to greater improvement; however, since dose levels were not randomly assigned, it is possible that some other factor (e.g., motivation) might be influencing both dose and outcome.

Findings from the current study also supported the second hypothesis that improvement in overall RQ (e.g., RF and RQ), even when examined alongside other potential mechanisms of change (e.g., reduction in depression and increase in abstinence from substance use), uniquely corresponded to improvement in caregiving behavior. That is, when other potential mechanisms of change were held constant, improvement in overall representational quality explained 8% of the unique variance in maternal caregiving behavior. Importantly, though, reduction in maternal depression also was found to explain significant unique variance (18%) in maternal caregiving behavior. This is not surprising, given extensive evidence that maternal depression influences parenting behavior (for reviews, see Goodman & Gotlib, 1999; Suchman & DeCoste, in press). Taken together, these results suggest the importance of providing parenting-oriented treatment for high-risk mothers in settings where comprehensive care (including psychiatric services) is readily available.

Finally, the third hypothesis in this study also was supported. Improvement in overall representational quality was found to function as a mechanism of change that explained 69% of the association between therapist fidelity to unique and essential MTP practices and improvement in caregiving behavior, even after other potential mechanisms (e.g., reduction in depression and increase in abstinence from substance use) were taken into account. This finding supports the premise of the MTP intervention that therapist efforts to enhance maternal RF, RQ, and understanding of children's behavior from an attachment perspective can lead to improvements in maternal RF and RQ, which in turn can lead to improvement in maternal interactions with the child. This finding also suggests a dose-response relationship in that more of the treatment dose led to more improvement at the representational level, which in turn led to more improvement at the behavioral level. However, since dose levels were not randomly assigned, it is possible that some other factor (e.g., motivation) might be influencing dose, mechanism, and outcome. This finding also must be considered preliminary because mechanism and outcome variables were measured at approximately the same time (posttreatment), and it is conceivable that improvements in caregiving may have led to improvements at the representational level.

### **Moderate Levels of Adherence**

Note that levels of MTP therapist adherence to the unique MTP components (43% for RF, 37% for the Internal Working Model, and 35% for Developmental Guidance about Attachment) were generally lower than the MTP therapist adherence to the generic treatment components (74% for Secure Alliance, 65% for Emotional Regulation, and 35% for Developmental Guidance). There are several possible explanations for these scores. First, mothers entering treatment for their substance use often face multiple crises and ongoing chaos in their day-to-day lives, and the attention of the therapists in this (and previous studies) was often focused on helping mothers establish stability in their daily lives (for a

review, see Suchman, Pajulo, DeCoste, & Mayes, 2006). Second, we have learned that when working with adults at prementalizing stages of RF, there is a necessary pull to provide behavioral strategies for regulating emotion while working on developing stronger mentalizing skills (for a discussion, see Munich, 2006). For example, if a mother cannot think about her anger toward her child in the moment, her most effective strategy for self-regulation is to leave the room until she feels calm again. Since most mothers in this study scored at prementalizing levels of RF (<4.0), the MTP therapists were required to first place heavy emphasis on behavioral regulation strategies (as indicated by the large percentage of time devoted to fostering emotional regulation) before focusing on enhancing RF. Similarly, there is a necessary pull to provide concrete problem-solving assistance (as indicated by the large percentage of time devoted to fostering a secure alliance) while working toward developing stronger mentalizing skills and more balanced and coherent representations of the caregiving relationship. In the Stage 2 study, we have modified the intervention to take this developmental progression into account. We also have modified the adherence coding system to include prereflective strategies (e.g., identifying physical sensations associated with affect) in the Fostering RF subscale.

Importantly, even though the MTP therapists spent less time fostering RF and RQ, and more time assisting mothers with problem solving and emotional regulation, it was the time spent on the former that accounted for improvement in caregiving behavior. This means that even in smaller doses, the focus on RF and representation is critical to improving parenting. That said, it could be counterproductive to increase adherence to the RF and representation components if it involves rushing the developmental process. At the same time, we are currently focusing on providing more developmental attachment-based developmental guidance in the MTP sessions.

### Study Limitations

This was a Stage 1 treatment development study (see Rounsaville, Carroll, & Onken, 2001), and the primary aims were to complete a treatment manual draft, treatment fidelity scales and methods, and a randomized pilot testing the preliminary feasibility, acceptability, and promise of the MTP intervention. As such, there are several inherent limitations. The sample size was small and may not be truly representative of the treatment population that it was intended to represent. The number of rated PE sessions also was limited; these data may therefore not be generalizable to the treatment population. Insights about the developmental progression of acquiring the capacity for RF came after the adherence scales were developed and adherence data were collected. Finally, although the MTP is firmly grounded in attachment theory, child attachment status was not measured in the pilot study (It was not a directly-targeted outcome, and conducting an attachment assessment would have been labor-intensive and costly at this early stage of intervention development.) Taken together, these limitations suggest the need to consider these findings preliminary. Each of these limitations is being addressed in a current, ongoing Stage 2 randomized clinical trial.

### Clinical Implications

From a clinical standpoint, these findings suggest that there is merit in persisting with the attachment-oriented goals of engaging mothers in the process of mentalizing and exploring representations of their relationships with their children. Although a larger proportion of the MTP therapist's time was spent securing the treatment alliance (73%) and addressing immediate difficulties with affect regulation (63%), therapist adherence to these generic components was not related to improvements at the representational level or improvement in caregiving behavior. Although the MTP therapist opportunities to focus on RF (40%) and exploring representations (38%) may have been more limited, it was these efforts, in the end, that led to improvement at the representation level and in caregiving behavior. It is

therefore important, when developing parenting interventions for substance-using mothers, to go beyond simply supporting them to resolve and cope with current crises to address underlying emotional aspects of their relationships with their children and other significant individuals in their lives.

## Conclusions

Limitations notwithstanding, the preliminary findings from this study address what Nock (2007) referred to as the final criterion that should be satisfied to demonstrate the operation of a mechanism of change that "... the findings articulate a credible explanation of the actual process through which one construct influences another and that this explanation is consistent with the definition of a mechanism of change as well as with broader scientific knowledge (p. 6s). The findings from this study are highly consistent with cumulative evidence from attachment research that internal representations of the caregiving relationship and the concomitant capacity for mentalization about the relationship are strong predictors of caregiving behavior (Fonagy et al., 2002; Sroufe et al., 2005).

Taken together, these findings provide clear and strong preliminary evidence for the tenets of attachment-based therapies: that caregiving behavior is a function of underlying representations and mental states, and that directly targeting change at the representational level can lead to notable improvements in caregiving behavior (whereas many previous interventions directly targeting behavioral change have failed to improve caregiving behavior; see Suchman, Pajulo et al., 2006). The validity of these findings is especially strengthened by the inclusion of generic as well as unique MTP treatment components, and competing potential mechanisms of change in the theoretical model.

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TABLE 1

Descriptive Data (n = 24)

Maternal Characteristics	M (SD)	Range
Age	30.21 (6.39)	19–42
Education	12.21 (1.32)	9–15
No. of Children	2.04 (1.30)	1–6
Marital Status	%	
Never married	33.3	
Cohabiting	33.3	
Married	16.7	
Separated/divorced	16.7	
Race/Ethnicity		
Caucasian	70.8	
African American	20.8	
Hispanic origin	88.3	
Unemployed	87.0	
Department of Children and Families Involved	58.3	
Primary Substance		
Heroin/opioids	66.7	
Cannabis	12.5	
Alcohol	12.5	
Cocaine	08.3	
Sessions Attended	9.46 (4.09)	0–12
Child Characteristics	M (SD)	Range
Age (months) at Baseline	18.54 (12.27)	1–36
Male	%	
	58.3	
Treatment Outcomes		
	Baseline	Posttreatment
	M (SD)	M (SD)
Reflective Functioning (PDI)	3.17 (.46)	3.33 (.49)
Representation Quality (WMCI)	2.83 (.47)	2.87 (.38)
Caregiving Behavior (NCAST)	35.41 (3.81)	37.67 (3.14)
	Range	Range
	2.00–3.88	2.47–4.41
	2.08–3.83	2.08–3.83
	28.00–41.00	31.00–45.00

Maternal Characteristics	<i>M (SD)</i>		Range
	Baseline Month	Posttreatment Month	
Depression (BDI)	15.54 (9.54)	13.86 (8.81)	00–33.0
Substance Use	<i>M (SD)<sup>a</sup></i>	<i>M (SD)<sup>a</sup></i>	Range
	44.00 (39.68)	23.50 (36.22)	0–100

PDI = The Parent Development Interview; WMCI = The Working Model of the Child Interview; NCAST = Nursing Child Assessment Satellite Training Teaching Scale; BDI = Beck Depression Inventory.

<sup>a</sup>Mean proportion of positive urine toxicology screens conducted during the month across the 24 participants.

TABLE 2

## Generic Components Common to MTP and PE

	Adherence Rating <sup>a</sup>	
	MTP (n = 190)	PE (n = 23)
Fostering a Secure Alliance	.77	.65
1. Builds alliance through listening and making encouraging, supportive statements (e.g., "You have worked so hard to be on time to your sessions.")		
2. Assists mother to address concrete, practical problem or an immediate crisis (e.g., suggests services or providers to consult)		
3. Mirrors (reflects, summarizes) mother's point of view (e.g., "So your mother can't seem to say anything good about your being in recovery.")		
4. Communicates acceptance for mother's point of view (e.g., accepts aberrant views of parenting such as "I smoke in the bathroom so that my child doesn't have to see it" without condoning them)		
5. Normalizes mother's parenting experiences (e.g., "I think this behavior can be exasperating to most parents.")		
Providing General Developmental Guidance	.35	.23
6. Expresses concern or assesses child's safety or welfare (e.g., "Do you worry that he might not be getting enough to eat? Because I'm worrying about that right now.")		
7. Provides general developmental explanation (e.g., "Children don't really understand the true difference between right and wrong until about age 5 or 6.")		
8. Offers developmentally appropriate strategies for responding to child's behavior (e.g., "You might find that distraction works better than explanation right now.")		
Fostering Emotional Regulation	.65	.64
9. Assists mother to contain or regulate strong negative emotion (e.g., "It sounds like it's hard to soothe yourself when this happens.")		
10. Accepts and normalizes mother's emotions (e.g., "It actually makes sense that you would feel mad if it seems like you can never win.")		

MTP = The Mothers and Toddlers Program; PE = Parent Education.

<sup>a</sup>Mean proportion of component items endorsed per session across all sessions (MTP = 190; PE = 23).

TABLE 3

## Unique Components on the MTP Adherence Scale

	Adherence Rating <sup>a</sup>	
	MTP ( <i>n</i> = 190)	PE ( <i>n</i> = 23)
Fostering Representation Quality	.37	.21
11. Encourages mother to explore representations of herself or significant other (e.g., "So, most of the time, your husband is like a 'sergeant,' as you called him, but occasionally it does feel like he has your back?")		
12. Encourages mother to explore representations of her child and their relationship (e.g., "You referred to your son as a 'maniac;' is that because he is so active or because you think he's misbehaving, or something else?")		
Fostering Reflective Functioning	.43	.26
13. Explores mother's thoughts/feelings about current stressor demanding immediate attention (e.g., "Tell me more about what made you curse just then.")		
14. Encourages mother to explore emotions that are difficult to access. (e.g., "You're laughing, but I am wondering if you are feeling a little uncomfortable right now.")		
15. Explains or encourages mother to explore mental states underlying/driving her own behavior (e.g., "I noticed that you haven't had the car fixed even though the judge made this a condition of your visitation. Do you think you might be feeling more discouraged this week?")		
16. Explains or encourages mother to explore mental states underlying another adult's behavior (e.g., "So your partner might be anxious too, do you think, about getting back together? Might that be why he hasn't called you?")		
17. Explains or encourages mother to explore the transactional nature of mental states and behaviors (between mother and other adult) (e.g., "Do you think he senses when you are feeling on edge? Could that be why he's avoiding the topic?")		
18. Explains or encourages mother to explore mental states underlying/driving child's behavior (e.g., "When he was kicking your seat so hard in the car after you left the prison, what do you think might have been going through his mind?")		
19. Explains or encourages mother to explore the transactional nature of mental states and behavior (between mother and child) (e.g., "He gave you a big smile just then—do you think there's something you might have done that made him light up like that?")		
20. Explains or encourages mother to think about her child's capacity for mentalizing from a developmental perspective (e.g., "I wonder if he can understand that a DVD is fragile and might break? Do you think he might be seeing this shiny exciting object that he can feel with his mouth?")		
21. Underscores mother's accurate attributions of child's mental states (e.g., "What you just said—about him missing his dad and having a hard time holding it together? That makes a lot of sense to me too.")		
Providing Attachment-Based Developmental Guidance	.35	.20
22. Provides developmental guidance from an attachment perspective (e.g., "I wonder if he keeps coming back to you find out whether you feel it's safe to explore that new toy.")		

MTP = The Mothers and Toddlers Program; PE = Parent Education.

**TABLE 4**

Results of Regression Analyses Testing Each Stage of the Mechanism Model

	Improvement in ...					
	Change in Reflective Representations			Change in Caregiving Behavior		
	Step	R <sup>2</sup> <sup>a</sup>	β <sup>a</sup>	R <sup>2</sup> <sup>b</sup>	β <sup>a</sup>	β <sup>a</sup>
<b>Covariates</b>						
Child age	1	.00	-.03	.00		.01
Maternal education		.06	.28	.03		.20
Assigned therapist		.02	.18	.03		.21
No. of sessions attended		.03	.18	.42 <sup>***</sup>		.73 <sup>***</sup>
<b>Potential Mechanisms of Change</b>						
	2					
Without Proposed Mechanism (i.e., without change in reflective representations)						
		R <sup>2</sup> <sup>b</sup>	β <sup>a</sup>		R <sup>2</sup> <sup>b</sup>	β <sup>a</sup>
Change in ...						
Depression (BDI)		.00	.00	.09 <sup>+</sup>	.18 <sup>*</sup>	-.44 <sup>**</sup>
Substance use (UTOX)		.07	-.27	.07	.00	.01
Reflective representations (PDI & WMCT)		n/a	n/a	n/a	.08 <sup>*</sup>	.32 <sup>*</sup>
Adherence to Treatment Components						
	3					
With Proposed Mechanism (i.e., with change in reflective representations)						
		R <sup>2</sup> <sup>b</sup>	β		R <sup>2</sup> <sup>b</sup>	β
Generic <sup>b</sup>		.02	-.26	.04	.05	-.40
Unique <sup>c</sup>		.27 <sup>*</sup>	.78 <sup>*</sup>	.13 <sup>*</sup>	.04	.35

<sup>a</sup> All beta weights are standardized.

<sup>b</sup> Generic components include fostering secure alliance, fostering emotional containment, and providing general developmental guidance.

<sup>c</sup> Unique components include promotion of fostering reflective functioning, fostering representation quality, and providing attachment-based developmental guidance.

<sup>+</sup>  $p < .10$ .

<sup>\*</sup>  $p < .05$ .

<sup>\*\*</sup>  $p < .01$ .

<sup>\*\*\*</sup>  $p < .001$  (two-tailed).