

# Keeping Mind in Mind: Mentalizing and Executive Functioning in Substance-Abusing Infant Mothers: Effect on Dyadic Relationship and Infant Outcome

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## Supplementary Issue: Harm to Others from Substance Use and Abuse

**ABSTRACT:** Although it is well documented that maternal substance abuse has a negative effect on the mother–child interaction, less is known about the pathways through which the interaction is compromised. The main objective of this research proposal is to describe an ongoing research project that focuses on associations between maternal executive function and the quality of mother–infant interaction when the mother has a history of substance abuse. We will also investigate the effects of multiple variables, including maternal relationship experiences, personality disposition, parental stress, comorbid mental illness, and addiction severity, on the dyadic interaction and child functioning. A group of 40–50 mothers with substance abuse problems and their infants aged 6–18 months will be included. The mothers will be assessed with neuropsychological tests, clinical interviews, self-administered questionnaires, and dyadic interaction observations as well as observation and assessment of child functioning. We will use a cross-sectional correlational design. The inclusion of the participants will end in October 2015. Further knowledge about the variables that are important for the mother–infant relationship can inform future research and clinical practice.

**KEYWORDS:** substance abuse, infant, dyadic interaction, mentalizing, executive function

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## Background

In this research proposal, we are presenting an ongoing research project that is part of the overarching "Mosaic Project."<sup>1</sup> In major theories of developmental psychology, a dyadic bidirectional interaction between the infant and a sensitive, responsive caregiver is regarded as essential for neural, cognitive, social, and emotional developmental outcomes for the child.<sup>1,2</sup> Sensitivity is referring to the ability to perceive infant signals accurately and to respond to them contingently and adequately and scaffold in accordance with infant needs, which in turn has been shown to affect the development of attachment security in the child.<sup>3,4</sup> It is in the context of an attachment relationship

with a coregulating caregiver that the child has the potential to gradually learn to understand and to regulate his/her own emotions and behavior.<sup>5</sup>

In contrast, adverse and insensitive interactions may result in developmental pathology, including compromised brain development in the child.<sup>6</sup> The infant brain is vulnerable to regulative failure in the caregiving dyad, and prolonged uncontrollable stress is particularly harmful.<sup>1</sup> Impaired ability to tolerate emotional distress is found to be a potential precursor for psychopathology in childhood and later on in adulthood.<sup>7–9</sup>

Many infants of substance-abusing mothers may be born with constitutional vulnerability, either as an effect of prenatal drug exposure or other stressors in pregnancy.<sup>10,11</sup> This suggests that these infants are in need of particularly sensitive caretaking. Interaction between the mothers with substance abuse problems and their infants is often characterized

<sup>1</sup>The project presented in this research proposal, "Keeping mind in mind," is part of an overarching project called the "Mosaic Project." The overall aim of the Mosaic Project is to generate knowledge about what kind of support is important to promote well-being, competence development, and participation in children living in families with parental mental illness and/or substance abuse problems.



by less sensitivity, emotional involvement, and attunement toward infant emotional cues, compared to mothers without these problems.<sup>12,13</sup> In addition, a negative emotional tone is often displayed in dyads with maternal substance abuse problems compared to other dyads.<sup>14</sup> Furthermore, difficulties in sensitivity displayed in the dyadic interaction seem to increase as children grow.<sup>12,13</sup> As shown in the Adverse Childhood Experience Study, cumulative negative childhood experiences including parental substance abuse impact the health throughout the life.<sup>15</sup>

Different factors related to the parental substance abuse may affect the quality of the mother–child relationship in numerous ways. The drug abuse may have genetic, neurobiological, and psychological stress including trauma, psychodynamic, and socioenvironmental etiology.<sup>16</sup> This indicates that difficulties experienced by substance-abusing parents may have been there before the actual substance abuse and may still be present after the substance abuse itself is terminated. In fact, as substance is often used as an inner regulator of psychological pain,<sup>17</sup> emotional dysregulation may pose a major problem when the substance is no longer there to regulate. Therefore, parental capacities may be vulnerable and may affect the quality of relationship and child outcomes in numerous ways.

The implicit or explicit ability to form mental representations of both ongoing and prior relationships seems to play an important role in parental sensitivity displayed toward infants.<sup>18</sup> Mentalizing (or reflective) capacity is defined as an ability to comprehend oneself and other people in terms of mental state constructs, for example, feelings, beliefs, intentions, and desires.<sup>19</sup> This capacity may be particularly important in early childhood when emotional and relational signals from the infant are subtle. The caregiver has to reflect upon both explicit and implicit information such as nonverbal embodied, kinesthetic information in the understanding of the mind of their child.<sup>20</sup> Furthermore, the parental capacity to mentalize has been shown to predict the attachment security in the child.<sup>21–23</sup>

Reflective abilities in substance-abusing mothers are generally low.<sup>24</sup> These difficulties seem to result in distorted ability to mentalize about own parenting and infant capabilities, including difficulties in responding contingently to infant cues,<sup>25</sup> which may lead to communicative disruptions in the dyadic relationship.<sup>26</sup> In addition, mothers with low mentalizing functioning are shown to have a heightened susceptibility for an insensitive and emotionally unresponsive way of interacting with their children. This can be observed as intrusiveness, withdrawal, or hostility in the mother.<sup>27</sup> There is a hypothesis that this may have to do with compromised affect regulation capacities in the mother, which in turn is closely correlated with executive functions such as impulse control, self-organization, self-monitoring, and self-agency.<sup>28–30</sup>

Evidence has shown that harsh, reactive, or insensitive parenting is correlated with poor maternal executive functioning.<sup>31</sup> Executive function may be defined as a cognitive

process that promotes the self-regulation of affect, behavior, and thought.<sup>32,33</sup> It is a multidimensional construct involving cognitive processes such as inhibition, working memory, cognitive flexibility, planning, verbal fluency, and emotion regulation.<sup>34</sup> Insensitive parenting has been associated with deficits in working memory,<sup>35</sup> cognitive flexibility,<sup>36</sup> selective attention,<sup>37</sup> and problem solving.<sup>38</sup>

Difficulties with mentalization and executive functions are common in many different kinds of psychopathological conditions.<sup>39</sup> Furthermore, the impairment in inhibitory control is a critical element in most theories of addiction.<sup>40</sup> Executive dysfunction may therefore serve as a risk marker for substance abuse.<sup>41</sup> Functioning that is needed in caring for infants, such as memory, attention, self-awareness, reflection about own behavior, stress tolerance, impulse control, and emotional regulation, may be weakened by the use of substances.<sup>42,43</sup> A consequence of poor executive functioning is dysregulated affect and behavior, which in turn are associated with the inability to accurately mentalize about the inner world of the child.<sup>44</sup>

In summary, research indicates that mentalization and executive functioning are important capacities in both maternal sensitive caregiving<sup>45,46</sup> and child development. However, the nature of the relationship between these important constructs still needs to be examined more thoroughly.<sup>47,48</sup> As the risk of compromised development in the child is high when the mothers have a substance abuse problem, there is a need for further investigation of which factors interrelate and in what ways. As far as we know, no previous studies have examined the associations between these capacities or their mutual influence on dyadic interaction in a clinical group of mothers with substance abuse problems.

## Scientific Aims

The main objective of this research project is to investigate the possible relationships between the factors that may affect caregiving in infant families with substance abuse problems. Of particular interest is maternal mentalizing and maternal executive functioning. Variables of maternal stress, mother's own relationship experiences (including trauma) both past and present, and personality structure will also be included in the study. We will investigate how these variables relate to dyadic measures and child outcome variables. The main hypothesis is that maternal stress and relationship experiences relate to child outcome via dyadic interaction, with maternal mentalizing and maternal executive functioning as important mediators.

## Methods

**Design.** Data will be collected at a single time point.

**Procedure.** The clinicians in contact with the families will manage the recruitment. This will include therapists in the adult treatment facilities, therapists in the children and adolescent's mental health clinics, or nurses in the municipality well clinics. The eligible participants identified as presenting with a previous or an ongoing substance abuse problem will be



provided an information sheet and brief information about the purpose of the research project. Mothers and babies meet with the researcher shortly after to complete consent forms and to receive further information about the procedure, both in person and through a written information sheet. Consent is given not only for the ongoing study but also for the possibility to be contacted in three to five years for a follow-up research.

The researcher meets with the families, either in the participants' home or in the treatment facility where they live. In the first meeting, the mothers are requested to complete a number of self-administered questionnaires. This meeting occurs within the inclusion period, which may last between two weeks up to two months. Depending on the needs of the mother, the researcher meets with the family for three or five times, with a duration of one to two hours per meeting to collect that data. Data collection includes three clinical interviews: where one is recorded and transcribed, one neuropsychological assessment, and one dyadic relational assessment, which is filmed. In all, the estimated time for the whole process is approximately seven hours on average per family. After the inclusion period, the mother is given the opportunity for individual feedback of the results and possible implications for intervention for herself and her baby. Depending on the wishes of the mother, feedback is given with or without a clinician of choice present.

**Participants.** In total, 40–50 mothers with a substance abuse problem will be recruited to participate in the study. The substance abuse may be of any severity and of any kind. The mothers may or may not have a comorbid mental illness. The infants are required to be between the ages of 6 and 18 months by the time of data collection, but they may be recruited earlier.

Exclusion criteria are maternal IQ below 70, which is determined with the Wechsler Abbreviated Scale of Intelligence (WASI), multiparity, premature birth (<32 weeks and <1500 g), or severely ill or multihandicapped child, which is defined by the recruiting clinician who consider the infant to have significant medical problems making it difficult to observe and score interaction with our methods. Neonatal abstinence syndrome (NAS) is not included in this definition.

The inclusion period is between 2014 and 2015. To date, 42 dyads have been included in the research project. Inclusion will be finished by October 2015.

The mothers and their babies are either living in treatment facilities specialized in caring for pregnant women with a substance abuse problem or in their own home in one of the number of selected municipalities.

The research team includes a clinical psychologist who specializes in infant and toddler psychology and community psychology supervised by a neuropsychologist, a clinical child and an adolescent psychologist, a psychiatrist, and a sociologist.

**Measures.** *Participant characteristics.* Newborn measures of weight, gestation age, head circumference, Appearance, Pulse, Grimace, Activity, Respiration in the newborn (APGAR

score), and assessment of NAS are collected from the hospital where the mother gave birth to the child. We interview the mother in order to obtain information about age, civil status, and living conditions from subscales on the semistructured interview European Addiction Severity Index (EuropASI), Fifth Edition.<sup>49</sup> This is a semistructured interview focusing on substance abuse, support status, relationships, physical, psychological, and legal issues.

Mental health in the mother is assessed by the diagnostic interview MINI plus version 5.0.0,<sup>50</sup> which is related to the diagnostic criteria in Diagnostic Manual of Mental Disorders, 4th edition (DSM-IV) (American Psychiatric Association, 1994) and ICD-10 (World Health Organization 1992) and subscales of the EuropASI.<sup>49</sup> The mother is requested to complete a self-administered questionnaire with a 10-item symptom checklist (SCL-10-R) that assesses symptoms of depression and anxiety in the mother.<sup>51</sup>

The existence of a substance use problem is an inclusion criterion for the participation. It is investigated by two clinical interviews in the assessment, using the EuropASI<sup>49</sup> and subscales in MINI plus version 5.0.0.<sup>50</sup>

Maternal mentalizing capacity is measured on three different dimensions. Mothers' verbal mentalizing capacity is assessed through the Parental Development Interview (PDI)<sup>52</sup> and the Reflective Functioning Scale.<sup>53</sup> The PDI is a semistructured interview that is designed to measure mentalizing by eliciting narratives about different aspects of parenting and being parented. The interview is recorded, transcribed, and rated in order to assess the level of reflective functioning in the parent. Parental mentalizing is also measured through the Parental Embodied Mentalizing (PEM).<sup>20</sup> PEM assesses the parent's capacity to implicitly conceive, comprehend, and extrapolate the infant's mental state from the whole-body kinesthetic expression of the baby and the parent's ability to adjust their own kinesthetic patterns accordingly. In addition to these two measures of mentalizing, the mother is requested to complete a self-administered questionnaire, the Reflective Functioning Questionnaire (RFQ-54); this is a 54-item questionnaire measuring the mother's own experiences of reflective functioning.<sup>54</sup>

Maternal executive function:

Working memory: The Letter-Number Sequencing Test (Wechsler Adult Intelligence Scale – Third Edition).

Cognitive inhibition: The Color – Word Interference Test, Condition 3 (CW 3) Delis-Kaplan Executive Function System (D-KEFS).<sup>55</sup>

Cognitive flexibility: The Color – Word Interference Test, Condition 4 (CW 4) (D-KEFS).<sup>55</sup>

Planning: The Tower Test (D-KEFS).<sup>56</sup>

Verbal fluency: The Letter Fluency Test (D-KEFS).<sup>56</sup>

Full scale estimated IQ (IQ): The WASI.<sup>57</sup>

The Behavior Rating Inventory of Executive Function™ is a self-report form composed of 75 items within nine theoretically and empirically derived clinical scales that measure



the various aspects of executive functioning.<sup>58</sup> It yields an overall score (global executive composite), which is a composite of two index scores (Behavioral Regulation Index [BRI] and the Metacognitive Index [MI]). The BRI is composed of four scales (inhibit, shift, emotional control, and self-monitor), and the MI is composed of five scales (initiate, working plan/organize, task monitor, and organization of materials). The self-report form for adults is used.

Maternal stress is measured by the Parenting Stress Index, which is a 120-item self-administered inventory that is designed to evaluate the magnitude of stress in the parent-child system on three domains such as child characteristics, parent characteristics, and general life stress.<sup>59</sup>

The main assessment of maternal relationship experience is measured by the self-administered questionnaire, Traumatic Antecedents Questionnaire (TAQ).<sup>60</sup> TAQ is a 42-item self-report questionnaire concerning the experiences of traumatic, as well as adaptive, quality during the four developmental periods, from infancy throughout childhood, adolescence, and adulthood. Subscales in the EuropASI<sup>49</sup> and subscales in the PDI<sup>52</sup> measure the child experiences, family relationships, and social support.

The Neo Personality Inventory-Revised (NEO-PI-R)<sup>61</sup> is administered to measure the personality disposition. The NEO-PI-R is a 240-item self-administered questionnaire measuring five major domains of normal personality. Subscales of the MINI plus version 5.0.0<sup>50</sup> also address personality dimensions on a clinical level.

The dyadic interaction between mother and child is assessed by PEM,<sup>4</sup> and with the Parent-Child Early Relational Assessment Scale (PC-ERA).<sup>62</sup> PC-ERA is designed to measure the quality of affect and behavior in parent-child interactions, focusing on both the parent and the child exclusively, as well as the dyadic quality between mother and child. The instrument uses ratings that are based on the observation of videotaped interactions and is assessed by a reliable coder.

The child outcome is partly measured by subscales of the PC-ERA<sup>62</sup> and by the Ages and Stages Questionnaire (ASQ),<sup>63</sup> as well as the Ages and Stages Questionnaire-Social Emotional Development (ASQ-SE).<sup>64</sup> ASQ is a parent-administered 30-item questionnaire with a complementary structured interview concerning the child development. The areas of assessment in ASQ are communication, fine motor skills, gross motor skills, problem solving, and social and emotional development in the child. ASQ-SE is a self-administered 22–36-item questionnaire and structured interview with the mother which assesses the child's social and emotional development. Self-regulation, tractability, communication, adjustability, autonomy, affect, and cooperation with others are the areas of assessment of child development in the ASQ-SE.

**Statistics.** Multiple regression analysis will be performed to test the effect of different maternal and relationship variables on the child outcome. We will use bivariate correlations

to assess the relationship between maternal executive functioning and mentalizing abilities, relationship variables, and child outcome variables.

## Ethics

This study has approval from the Norwegian Regional Ethics Committee. Approval is provided by the mothers (and fathers if present in their babies lives) in a written informed consent form, which is gathered by the researcher before starting the data collection. Permission to conduct the study has been obtained from the site managers of each clinic. Participants will be informed that their decision to participate in the study is voluntary and will not affect their current or future care. Mothers will also be informed that even after deciding to participate in the study, they can still decline to answer questions or to take part in specific activities, and they may terminate their participation at any time without any penalty.

Overall, only minimal risks are anticipated. Some participants may feel uncomfortable when answering questions that address sensitive topics, when under the neuropsychological assessment or when being filmed for the relationship assessment. This will be carefully addressed during the assessment, and adjustments will be made accordingly.

There are no monetary incentives or reimbursements for the participants. All participants will be given the opportunity to receive an individual feedback of results from the assessment and some guidance on possible intervention. Moreover, the clinicians will get information about the assessment to use in interventions if the participants approve it.

## Caveats

It is a relatively small sample, which may limit the power of analysis.

The group of all mothers expressed a motivation to take part in the project, which means that they are self-selected, have an interest in gaining knowledge about own parenting, and their potential for intervention. Although this is the strength for the participation in the project, there may be a difference between mothers taking part in the project and mothers who declined participation or mothers who were not approached by the clinicians to take part in the study. Another possible limitation is that there is no nonclinical group to compare with.

As the inclusion criteria is a substance abuse of any kind, mothers may have had a severe problem with illegal substances, or by own definition, minor problem with legal substances, which may be a limitation as the effect on family dynamics may be different.

Yet, another possible limitation is how much previous treatment the mothers have received before the assessment. There may be a large diversity in the experience of therapeutic intervention in the sample of mothers, both with regard to parenting, substance abuse, and psychological problems.

During the assessment, a few of the mothers have lost the daily custody of their child. This might be a limitation as



the mothers both had a different caretaking role and may have a different emotion regulation capacity due to a supposedly stressful everyday life. This may also be an important factor to look into during the interpretation of the data, that is, if mothers without daily custody generally differ from mothers with daily custody with regard to maternal functioning.

Finally, the main statistical analysis involves a cross-sectional correlation. Therefore, any causality will be undetermined.

## Implications

The present study has the potential to advance scientific knowledge in several ways. First, there are few studies focusing on the relationship between mentalizing and executive functioning, and the implications of the relationship between these two factors raise. There might be a potentially different dynamic behind vulnerable mentalizing abilities when the mother has also poor executive functioning compared to mothers who has poor mentalizing capacities but without problems in executive functioning. This may improve the understanding of underlying mechanisms of parental functioning in substance-abusing mothers.

Second, this study may also highlight the dynamics underlying vulnerability in the caregiving dyad when the mothers have a substance abuse problem. Understanding the relationship between multiple variables, including mentalizing and executive functioning, may help us improve targeted and more fine-grained intervention toward vulnerable families. While the effectiveness of mentalization-based interventions given to substance-abusing parents has been shown,<sup>65–67</sup> few studies highlight the potential of assessing executive functioning in addition to mentalizing capacity to suggest a mode of intervention depending on the strengths and vulnerability in the mother.

Third, on the basis of new knowledge about the relationship between different maternal and dyadic variables, we hope that this study can contribute to a clarification of relational interventions that may reduce the potential harm to infant development and outcome. This also implies that the research will provide clinical services and municipalities meeting families with substance abuse problems a new tool for early intervention.

Finally, the proposed research is expected to yield valuable information for future research concerning families with substance abuse problems.

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## Author Contributions

Conceived and designed the experiments: UH, MGØ, KS, FS, AH. Analyzed the data: UH, MGØ. Wrote the first draft of the manuscript: UK, MGØ. Contributed to the

writing of the manuscript: UH, MGØ, KS, AH. Agree with manuscript results and conclusions: UH, MGØ, KS, FS, AH. Jointly developed the structure and arguments for the paper: UH, MGØ. Made critical revisions and approved final version: UH, MGØ. All authors reviewed and approved of the final manuscript.

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