

Research report

# Interventions with depressed mothers and their infants: Modifying interactive behaviours<sup>☆</sup>

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## Abstract

**Background:** Postpartum depression (PPD) has a prevalence ranging from 3% to 30% and is associated with serious infant growth and developmental problems. Interventions directed at improving maternal mood have been unsuccessful in producing changes in observed face-to-face interactions between mother and infant. The Keys to Caregiving (KTC) is an intervention program that helps parents to understand and respond to infant behaviours, with a goal of increasing positive affective expressions in infants. In this pilot study, KTC was used with mothers suffering from mild to moderate PPD and their infants.

**Methods:** PPD was confirmed by scores on the Edinburgh Postnatal Depression Scale and the Beck Depression Inventory. Eleven dyads completed the study. KTC was carried out in 5 weekly group sessions, beginning at infant age of 3 months. Dyads were videotaped prior to and after KTC, using the Face-to-Face Still-Face paradigm, which assesses infants' responses during normal play and the effects of the Still-Face perturbation. The tapes were scored for infant facial emotion expressions.

**Results:** After intervention, infants displayed a marked increase in Interest and Joy when interacting face-to-face with their mothers, even though mothers' depression ratings did not change.

**Limitations:** This pilot study is limited by lack of control dyads, however, it provides the foundation necessary for a full trial.

**Conclusions:** This study suggests that intervention that focuses on what mothers do with their infants instead of how they feel can be effective in increasing infants' positive responsiveness and improving infant outcomes. Such interventions can be an essential component of treatment when mothers present with postpartum depression.

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**Keywords:** Postpartum depression; Mother–infant intervention; Still-Face perturbation; Infant facial emotion

## 1. Introduction

Postpartum depression (PPD) has a prevalence ranging from 3% to as high as 30% in the year following delivery (Field, 1995; O'Hara and Swain, 1996). These findings are critical because maternal depression is associated with serious consequences for the infant, such as growth and developmental delays (Field, 1997), insecure attachment to the mother (Teti et al., 1995), poor cognitive functioning (Stanley et al., 2004), later

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affective disorders (Beardslee et al., 1993), and behaviour problems (Cohn and Campbell, 1992).

Studies have indicated the intergenerational transmission of depression<sup>1</sup> via the mother's non-contingent or impaired responsiveness during interactions with the infant (e.g., Field et al., 1988; Murray and Cooper, 2003). Non-contingent responsiveness between mothers and infants disrupts early interactions in different ways. Many depressed mothers tend to be apathetic and unresponsive to infants' communicative behaviours. In this context the infant gradually becomes more and more apathetic. In contrast, other depressed mothers are overactive with high levels of ongoing 'intrusive' stimulation, possibly as a result of tension or a more intense effort to remain engaged with the infant. The infants of these latter mothers tend to show more avoidant behaviours, such as grimacing or turning away from the mother.

Finally, studies suggest that those patterns of interacting, which develop between mothers and infants, can persist even after the mother's acute depressive symptoms may have subsided (e.g., Weinberg and Tronick, 1998). Less positive interactions and insecure attachment to the mother can remain beyond the period of the mother's depressed mood. As well, treatment for depression per se, does not necessarily improve the quality of mother–infant interactions (Cooper and Murray, 1997). It has been reported that psychological treatments including non-directive counseling, cognitive-behavioural therapy and psychodynamic therapy have only limited short-term benefits (Murray et al., 2003). Despite symptomatic improvement and initial gains in relationships, as reported by mothers, the difficulties in emotional and behavioural problems persist. Research has also confirmed that infants of depressed mothers show less positive responsiveness even when interacting with non-depressed adults (Field et al., 1988). In a cyclical fashion, the adults are then less stimulated to respond. When treating postpartum depressed mothers, the direct relationship between mother and infant is one vital consideration, which can intercept that cyclical downward spiral.

<sup>1</sup> Studies about genetic influences is another line of research that can also help to explain intergenerational transmission of depression in offspring. For example, in addition to twin studies about the transmission of depression, findings about gender differences in emotional expressivity further suggest the role of genetic influences. Male infants have been found to show greater reactivity and have more difficulty than females in modulating negative affect, on their own (Weinberg et al., 1999). However, Sander (2000) suggests that such genetic determinants (e.g., reactivity, temperament) are embedded in the caregiving environment and can be altered in the process of development.

Past research suggests the value of focusing on actual behaviours in an interactive context (e.g., Beebe, 2003; McDonough, 2004). The adverse impact of PPD on infant development is strongly influenced by the quality of early mother–infant interactions. These empirical findings about the documented difficulties between depressed mothers and their infants, and the effect of hands-on efforts in altering dysfunctional behaviours are the basis for the intervention selected in the present study.

The skills training intervention used in the current study helps the mother, through a series of sequential steps, to develop effective ways of managing and comforting the infant when distressed, and to understand the 'meaning' of infant's behaviours and how contingent responses to infant cues increase positive interactions. Importantly, an infant who begins to more frequently show interest in the mother, smile and sustain eye contact is also likely to evoke more enjoyable and arousing experiences for the mother herself. The goal of this study was to assess whether the intervention could counteract the marked decrease in positive responsiveness and involvement between depressed mothers and their infants. Such an improvement in mother–infant interactions is very likely to be demonstrated by an increase in the infant's positive emotion expressions while engaged with the mother.

## 2. Methods

### 2.1. Participants

Participants for this pilot study were recruited to evaluate the efficacy of an intervention program with depressed mothers and their infants, and to examine the effects of the intervention on infant affective expressions. Of the 17 mothers who participated in the study, 11 of those dyads completed all phases of the study. This included baseline and follow-up assessment, and all of the program's skills training sessions. Four of the mothers who discontinued the intervention had moved to a distant location, and the other mothers could not be contacted. The moves to another locality were work-related (for spouse) or change of residence (move to another city or distant/out lying communities, which made commuting difficult or not possible). The other three mothers could not be contacted, and we were unable to ascertain the reason for this change. With regard to demographics, no significant differences were noted between mothers who did and did not complete the program and follow-up assessments.

After ethics approval was obtained, a community sample of mothers who presented with depressed mood

were recruited from public health clinics. Information sheets and presentations were provided for the mothers, who then voluntarily approached or contacted our research staff. We do not have information about other mothers who potentially met criteria, but did not volunteer to participate. If a mother agreed to participate in the study, she first signed a consent form before the procedures were initiated. The recruitment process was ongoing until the end of the research project. The number of participants (17) was only limited by time and resource constraints.

The mothers in the study were all primary caregivers and at least 21 years of age. The mean age for this group was 33 years with a range of 21–41 years. Nine mothers had completed at least 1 year of college; the two other mothers had a senior high school level of education. For three of the mother–infant dyads, there was one older sibling in the family; this was the first child for the other mothers. Yearly household income ranged from <\$20,000 to >\$80,000. All the mothers were either married or had a permanent partner. None of the mothers were employed outside of the home at time of this study.

The inclusion criteria for the babies required that the babies were singleton, with 36 weeks or more gestation period and birth weight at least 2500 g. At the time of enrollment, there was no evidence of congenital malformations, chronic diseases, or sensory-neural disabilities. There were equal numbers of male and female infants in the study. Average age at enrollment was 3.5 months with an age range of 3–4 months.

In addition to having an infant approximately 3 months of age who met inclusion criteria, mothers were given two questionnaires to confirm the presence of depressed mood. Scores on the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al., 1987) and the Beck Depression Inventory-II (BDI-II) (Beck et al., 1996) determined criteria for inclusion in the study. These questionnaires are frequently used in studies to identify a depressive mood in the mother, although it is not diagnostic of a depressive disorder. Depressive mood or affect in the mother is considered the key element for the infant. At 3 months postpartum, the mothers included obtained scores above 9 on the EPDS or BDI-II; or very low BDI-II scores of less than 4. Test results with the EPDS and BDI-II did not reveal significant changes in depression scores at the beginning and end of the intervention program.

It has been noted that infants of mothers scoring very low (or high) on the BDI self-report depression scales have been observed to appear depressed during face-to-face play with their mothers (Pickens and Field, 1993). Infants of high and low scoring mothers on the BDI also show significantly fewer Interest expressions, and more

Sadness and Anger (Lyons-Ruth et al., 1986). The above studies have identified 9 or above as high and below 4 as low. Those scores and behaviours indicated that the infants appeared to be responding to depressive affect in the mothers.

## 2.2. Treatment procedures

### 2.2.1. Skills training program

The Keys to Caregiving (KTC) (Spietz et al., 1990) used in this study helps parents in a supportive way to progressively improve appropriate stimulation and responses to infant behaviours. A semi-structured group protocol, with built in flexibility was developed for the present study, based on the KTC program. The mothers who participated in the group sessions were assisted to understand the ‘meaning’ of many different infant behaviours in different daily contexts, for example, the ‘language’ of the young infant and their varied individual differences; how vocal, gestural, and bodily behaviors come together to signal what the baby wants and doesn’t want; how to console or modulate infant state to enhance quality of mother–infant interaction, etc.

Mothers were given the opportunity to practice with the infant during sessions and/or at home, and to discuss any concerns about the infant or their evolving relationship. The ‘meaning’ of infant behaviours was carefully reviewed and practiced in the sessions.

The teaching system for the five sessions used in the present study focused on different topics to help the mother understand the infant’s particular behaviours. A different aspect of infants’ behaviours is worked on each week—what to do when infants show those behaviours and how to enjoy interactions. The information and ideas from the sessions build on each other from week to week, as described below.

*Sessions:* (1) Infant States—Infants have different levels of sleeping and waking. These are called ‘states’. For example, when asleep, a baby may be in Quiet sleep, Active sleep, or Drowsy state. When fully awake, a baby can be in three different awake states—Quiet Alert, Active Alert, or Crying. We show what to do for the baby in each state. During Active sleep, for example, babies may wiggle around a lot and cry out in their sleep, but their eyes do not open. Mothers may think their babies are awake at that time, but feeding or playing with a baby will be unsuccessful. When mothers learn how to recognize each state and what works best, caregiving becomes a lot easier. (2) Infant Behaviours—This session builds on what mothers learned about infant states. The state the baby is in will affect how he or she behaves. Babies also are individuals. Every baby

is his/her 'own person'. Mothers learn to watch for their own babies unique behaviours in different contexts (e.g., during feeding, bathing, changing and holding). (3) Infant Cues—A baby's nonverbal language is made up of gestures, movements, posture and expressions. With the mothers, we look at how several of those behaviours can happen together to communicate what a baby needs. (4) State Modulation—Modulate means to change something. State modulation is how to change a baby's sleep and awake states, for example, waking up a sleepy baby to eat or play; or settling a fussy baby to sleep. Babies sleep and feed better, and enjoy more play when their states are modulated. (5) Feeding—Mothers learn how to hold the baby, relax and enjoy the feeding with the baby. It is also a good time for the mother and baby to interact. There is a suck-pause rhythm to babies' sucking, so that during the pauses mothers have a very good 'window of time' to capture the infant's attention.

Overall, the Keys to Caregiving is designed to enhance mothers' perceptions of infants' repertoires of behaviours; and the mothers practice new skills during training sessions and at home. This promotes more frequent mutually enjoyable episodes and makes it easier to 'repair' mismatches that can arise during interactions.

### 2.3. Assessments

#### 2.3.1. Still-Face perturbation

The Face-to-Face Still-Face perturbation (FFSF) (Tronick et al., 1978) was carried out during the video recordings of mother and infant interactions, pre- and post-interventions. In the FFSF procedure the mother is asked to play naturally with the baby for 2 min, without the use of toys (1st Free Play). This is followed by a 1-min episode when the mother is asked to remain unresponsive vocally and gesturally with a flat facial expression, while looking at her infant (Still-Face). Immediately after the Still-Face minute, the mother resumes natural play for another 2 min (2nd Free-Play). Numerous studies that utilized this paradigm have revealed differences between high and low risk infants, in their responses to the stress of the Still-Face, and the non-stressful Free-Play episodes (e.g., Tronick, 1989, 2004). These episodes of mother and infant face-to-face interactions were video-recorded at a university media studio. When the mothers and infants arrived at the studio, ample time was allowed for conversation to make mother and infant as comfortable as possible. Then the mother and infant were placed in a face-to-face position. The infant was placed in a commercial baby seat, at approximately a 45° angle.

The seat for the mother was placed about 18 in. directly in front of her infant.

Two cameras, focused on the mother and the infant, were connected to a split screen generator. The split screen provided a close-up view of the mother's face and upper torso; and the infant's face and a full body view. Time codes were also inserted in the screen through a digital timer. Later when the data were coded, a variable control mechanism allowed for backward and forward slow motion viewing of the recorded tapes, as needed. The digital time displays allowed for sequential tracking of infant facial expressions, using 1-s intervals.

#### 2.3.2. Assessment of video recordings

*System for Identifying Affect Expressions by Holistic Judgments (AFFEX-Revised)* (Izard et al., 1989): The video recordings during the three episodes of the FFSF provided data for coding infant facial expression changes while interacting with their mothers. The AFFEX was used to obtain outcome measures of infant emotion expressions, before and after the interventions were completed. The AFFEX has been a frequently used coding system for the past 20 years, which can reliably identify eight fundamental emotional expressions—Interest, Joy, Surprise, Sadness, Anger Disgust, Contempt, Fear and Physical Distress or Pain. The AFFEX manual and coding system (Izard et al., 1989) was developed to measure a range of infant facial emotion changes. For example, infant facial emotions were measured subsequent to varied stimulus events (Izard et al., 1989). Construct and predictive validity for the AFFEX has been indicated in a series of studies by Izard et al. (1989). Predictive validity of this instrument has also been documented by Parisi (1977). For this study, the presence of infant facial emotion was scored on a 1-s time base, for four fundamental expressions: Interest, Joy, Sadness and Anger. The other emotion expressions were not shown by the infants in this study, or occurred infrequently. All the tapes were coded by one of our experienced researchers. With regard to reliability checks for infant facial emotion expressions, a random sample (20%) were recoded by another coder who was blind to the infants' status, in terms of pre- or post-intervention. This involved 8 pre- and 7 post-intervention episodes for different dyads. Reliability coefficient is .88, which corresponds to 78% inter-rater agreement.

### 3. Results and interpretation

Table 1 displays the results in terms of infant facial emotions pre- and post-intervention, during the three episodes of the Still-Face procedure—1st Free Play;



Table 1  
Infants' facial emotions during the Still-Face procedure

	Pre-intervention (%)	Range (%)	Post-intervention (%)	Range (%)
<i>1st Free-Play</i>				
Interest	39.6	5.0–81.0	67.0	25.0–85.0
Joy	2.8	0.0–13.0	13.0	0.0–50.0
Sadness	0.8	0.0–8.0	0.0	0.0
Anger	0.3	0.0–3.0	0.0	0.0
<i>Still-Face</i>				
Interest	27.2	0.8–38.0	24.7	11.0–46.0
Joy	0.1	0.0–5.0	1.6	0.0–4.0
Sadness	2.1	0.0–8.0	4.8	0.4–15.0
Anger	0.0	0.0	0.4	0.0–2.0
<i>2nd Free-Play</i>				
Interest	30.0	0.0–68.0	51.7	18.0–91.0
Joy	4.8	0.0–13.0	6.0	0.0–21.0
Sadness	0.6	0.0–12.0	5.0	0.0–28.0
Anger	0.0	0.0	2.2	0.0–23.0

Percentage of time for infants' emotion expressions pre-and post-interventions.  $N=11$ .

After interventions, infants showed marked increase in positive emotion expressions (Interest; Joy). Following the Still-Face perturbation (especially after interventions) some infants also showed an increase in negative emotions (Sadness; Anger). In general, post-intervention infants communicated their feelings more clearly, as shown in higher frequency of emotion expression—likely anticipating mother's response to signals or cues about both pleasure and distress.

Still-Face; 2nd Free-Play. The facial emotions shown by the infants during the episodes do not add up to 100%, because there are other appearances that are not codable and do not fit with any particular meaningful facial expression. That said, explicit facial emotion expressions are considered very important for communication, but such expressions usually do not emerge 100% of the time.

In the following sections, we first describe the findings about infants' Interest and Joy expressions that emerge pre- and post-interventions. Subsequently, the emergence of Sad and Anger expressions are discussed.

*Interest/Joy*: The results of the present study demonstrate a significant increase in infants' Interest expressions, post-intervention, evident during the 1st Free-Play episode. Although infants' Joy expressions are less frequent as compared to Interest, the infants' measures of Joy during interactions also more than quadrupled in frequency during the 1st Free-Play, following the intervention. As expected, after the Still-Face was initiated, infants showed a marked decrease in Interest and Joy when interacting with the 'flat expressionless' partner. Despite that disruption, Interest and Joy were higher in the post-intervention 2nd Free Play episode which suggests

that after the intervention infants were able to 'recover' more effectively from the Still-Face perturbation.

*Sadness/Anger*: The disruptive effect of the Still-Face was different for infants' Sad and Anger expressions, pre- and post-interventions. Pre-intervention, infants demonstrated Anger and Sadness during the 1st Free-Play, whereas these expressions were absent during the 1st Free-Play, post-intervention. However, after the disruptive effect of the Still-Face, the infants (post-intervention as compared to pre-intervention) were more demonstrative in terms of negative expressive behaviours (Sadness, Anger).

Finally, in considering the wide range of facial emotion expressions among the infants in the study, it is essential to look more closely at what is happening. For example, when we look at the Free-Play episodes for all the infants wide variability in scores is noted. However, in reviewing our findings 'case-by-case' for the individual infants, the range of improvement (from 'baseline' pre- to post-intervention) for the positive emotion expressions of Interest and Joy tended to be consistent among the infants.

With regard to the potential effects of maturation, the following information suggests that maturation is unlikely to have been a significant factor in the increase of Interest and Joy. The findings of relatively low frequency of infant positive emotion expressions *pre-intervention* are consistent with other studies about PPD and the social-emotional behaviours displayed by the infants (e.g., Pickens and Field, 1993). In contrast, *post-intervention*, the proportion of time that infants' Interest and Joy expressions occurred during the 1st Free-Play interactions was similar (in terms of relation between positive and negative facial emotion) to that observed in other studies with infants of the same age, with their non-depressed mothers (e.g., Kogan and Carter, 1996; Pickens and Field, 1993).

#### 4. Discussion

The increase in positive expressions during the 1st Free Play, along with more negative expressions following the stress of the Still-Face, indicates that after interventions babies were more likely to anticipate a mother's response. They then communicated their feelings more readily and gave clearer signals about what they 'want and don't want'. It is important to note that such behaviours and expectations form the basis for a positive relationship and more favourable early development. A responsive infant can also have a positive influence on the mother by motivating her to spend more time interacting with the infant.

**Clinical Relevance:** In conclusion, the strategies included in the intervention program are likely to be effective in strengthening the mother–infant relationship and promoting more time and availability for positive interactions. This is important, because as noted mothers' can continue to experience problems in relating to the infant even after post-partum depression has subsided. As well, depressive symptoms might re-emerge. The KTC is a comprehensive skills training program that assists mothers in developing and practicing appropriate patterns of responding and interacting during varied activities that commonly occur in the daily life of infants. With practice during sessions and in different contexts at home these responsive patterns are likely to become habitual, which can be beneficial for all mothers with present or past history of depression, and as a preventive intervention.

Such improvement in early relationships could lower the risk of negative developmental outcomes and improve infants' functioning. When infants experience a more sensitive and responsive caregiving environment they are more likely to use their parents as a secure base to explore the environment. Such a sensitive caregiving environment is shown when caregivers understand infant cueing behaviours and respond promptly and appropriately (for example, an infant needs stimulation to maintain attention and engage in social emotional interactions attuned to his/her level of arousal; soothing when distressed, etc.). This fosters successful development in cognitive abilities and social skills. Thus, in addition to specific treatment for depression (e.g., antidepressant medication) and facilitating the use of other supports or resources, an intensive skills training program is likely to provide significant additional benefit. The particular skills training intervention used for this study could be incorporated into a broad-based treatment approach, because it is likely to be beneficial for many different mothers and infants.

**Limitations:** The present findings are based on a pilot study, and need to be corroborated with a larger sample, longer term follow-up and a control group of dyads.

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