

# Supporting insensitive mothers: the Vilnius randomized control trial of video-feedback intervention to promote maternal sensitivity and infant attachment security

L. Kalinauskiene,\* D. Cekuoliene,\* M. H. Van IJzendoorn,† M. J. Bakermans-Kranenburg,† F. Juffer† and I. Kusakovskaja\*

\*Vilnius University, Vilnius, Lithuania, and

†Leiden University, Leiden, The Netherlands

Accepted for publication 15 January 2009

## Abstract

**Objective** This randomized control trial examined the effects of a short-term, interaction-focused and attachment-based video-feedback intervention (VIPP: video-feedback intervention to promote positive parenting).

**Design** VIPP effect on mothers' sensitive responsiveness and infant-mother attachment security was evaluated in a sample ( $n = 54$ ) of low sensitive, non-clinical, middle class Lithuanian mothers.

**Methods** Maternal sensitivity was assessed in a free play session with the Ainsworth's sensitivity scale, and attachment security was observed using the Attachment Q sort for home observations.

**Results** We found that the intervention mothers indeed significantly improved their sensitive responsiveness through participation in our VIPP. The effect size was large according to Cohen's criteria,  $d = 0.78$ . VIPP enhanced maternal sensitive responsiveness even when maternal age, educational level, depression, daily hassles, efficacy, infant gender, and infant negative and positive affect were controlled for. However, attachment security in the VIPP infants was not enhanced after the intervention, compared with the control infants, and the infants did not seem to be differentially susceptible to the increase in maternal sensitivity dependent on their temperamental reactivity.

**Conclusion** We suggest that a relatively brief and low-cost programme can provide effective support for mothers who lack sensitivity in the interactions with their infants.

## Keywords

infant attachment, intervention, maternal sensitivity, randomized control trial, video-feedback intervention to promote positive parenting

## Correspondence:

Marinus Van IJzendoorn,  
Leiden University, Centre  
for Child and Family  
Studies, PO Box 9555,  
2300 RB Leiden, The  
Netherlands  
E-mail:  
vanijzen@fsw.leidenuniv.nl

A mother's mental representations of attachment as well as her behaviour to her infant, influenced by her attachment representations, are associated with the quality of the infant's attachment to the mother (Van IJzendoorn 1995; De Wolff & Van IJzendoorn 1997; Berlin & Cassidy 2000). Longitudinal studies on secure and insecure infant attachment reveal the beneficial long-term effects of secure infant attachment on children's later

social-emotional and cognitive functioning (Thompson 1999; Sroufe 2005). The attachment relationship may affect personality and social-emotional development as it scaffolds neurobiological development, including the development of stress regulatory systems (Glaser 2000; Gunnar & Quevedo 2007).

Maternal sensitivity is considered to be the primary determinant of attachment security (Ainsworth *et al.* 1978) among

other determinants such as the spousal relationship, parental social support, mother's personality and other maternal behaviours and contextual conditions (Belsky 1999). Maternal sensitivity is defined as a mother's ability to perceive her infant's signals appropriately and respond to them promptly and adequately (Ainsworth *et al.* 1974).

Infant's attachment security can be enhanced by parenting interventions (Egeland *et al.* 2000; Bakermans-Kranenburg *et al.* 2003). Two major points of view exist on what kind of intervention is more beneficial and effective. One point of view argues that 'less is more', and holds that short-term interaction-focused interventions are the most beneficial in enhancing early attachments in infants (Bakermans-Kranenburg *et al.* 2003). Another perspective, in contrast, suggests that 'more and broader is better', and emphasizes the benefits of long-term comprehensive and intensive programmes, in particular in multiproblem families (Egeland *et al.* 2000). Meta-analytical results demonstrate that the success of intervention programmes is moderate in increasing children's attachment security, but they seem to have larger impact on parental sensitivity, not only in non-clinical groups but even in clinical samples and multiproblem families (Bakermans-Kranenburg *et al.* 2003). However, not much is known about the long-term effects of brief and focused interventions. One might argue that teaching mothers to be sensitive to their infants is not sufficient because maternal mental representations of attachment would remain unchanged and in the long run the mothers might not be able to adequately respond to their infant's changed attachment needs and signals, and to keep supporting a secure attachment relationship (Egeland *et al.* 2000).

Currently, attachment intervention research is moving beyond generic effects to addressing the question what works for whom. That is, research focuses on the different types of interventions and their effectiveness for various groups and samples. In this respect one of the major questions is the differential effectiveness of interventions in groups more or less optimally functioning in terms of parent-child interactions. It cannot be expected that all children and their parents benefit equally from the same intervention. More specifically, in families with low levels of parenting quality more might be gained by an intervention effort, and in fact only in such low functioning families interventions might be effective at all. In the present intervention study the participants were therefore selected on the basis of the low level of maternal sensitivity to infant signals.

In contrast to the large number of intervention studies performed in multi and high-risk samples, the present study was conducted in a non-clinical middle class sample. The selected

mothers had only one major risk factor for their children's insecure attachment formation – they were inconsistently sensitive or insensitive to their infant's signals. To our knowledge, this is the first intervention study in which sample selection was based solely on behavioural criteria of sensitive parenting. In our study the intervention mothers' sensitivity to their infants' signals was maximally 5 (inconsistently sensitive) or less on the 9-point Ainsworth's sensitivity rating scale (Ainsworth *et al.* 1974). Because of the relation between parental sensitivity and children's attachment (Ainsworth *et al.* 1978; De Wolff & Van IJzendoorn 1997), the mothers, who lack sensitivity to their infants' signals, should be good candidates for an intervention to prevent infants' insecure attachment to develop. In order to bring about changes in mothers' sensitive behaviour, new ways of responding to infants' signals must be modelled and reinforced. Consequently, the right choice for these mothers would be a behaviourally focused intervention, which could help them to become more aware of their infants' signals and to interpret these signals more accurately. Short-term interaction-oriented intervention may be considered as an optimal type of intervention in low-risk, non-clinical groups. There is evidence that low-risk families show a positive response to a provision of information and feedback about parenting (Barnard *et al.* 1988). Thus, we think that the mothers in our sample would profit from interaction-oriented intervention with additional information about parenting.

Although the mothers in our intervention come from non-clinical middle class backgrounds it does not mean that some of them would not suffer from depressive feelings, accumulated daily strains and stresses, and feelings of incompetence and lack of efficacy in dealing with child-rearing issues. Because we are first and foremost interested in the effects of our intervention approach in mothers with low sensitivity but otherwise showing similar levels of psychosocial functioning we also assessed and controlled for the level of maternal depression, daily stresses and maternal self-efficacy. In previous studies maternal depression has been shown to reduce the likelihood of secure attachments (Martins & Gaffan 2000; Campbell *et al.* 2004) as sensitivity might decrease in depressed mothers, (Mertesacker *et al.* 2004; Milgrom *et al.* 2004). When mothers become overwhelmed by daily stresses their sensitivity may also suffer (Crnic *et al.* 1986; Scher & Maysless 2000; Coyl *et al.* 2002). Self-efficacy refers to one's belief in the ability to successfully perform the behaviour necessary to achieve a desired outcome (Bandura 1977, 1982). Self-efficacy may have a positive impact on maternal behaviour in general and sensitivity in particular (Teti & Gelfand 1991; Hsu & Lavelli 2005). Low self-efficacious mothers may prove to be less sensitive to their infants'

behaviours, because they might be less persistent when soothing a distressed infant (Teti & Gelfand 1991).

Children high in negative emotion, particularly in the early years, suffer most from adverse environments but also appear to benefit disproportionately from supportive rearing environments (Belsky 1997; Boyce & Ellis 2005). For example, Feldman and colleagues (1999) found that 9-month olds scoring high on negativity who experienced low levels of synchrony in mother–infant interaction manifested more non-compliance at age 2 years than other children. When such infants experienced mutually synchronous mother–infant interaction, however, they displayed greater self-control than children manifesting much less negativity as infants. More recently, Kochanska and colleagues (2007) observed that highly fearful 15-month-olds experiencing high levels of power assertive paternal discipline were most likely to cheat in a game as 38-month-olds, but when cared for in a supportive manner these fearful toddlers manifested the most rule-compatible conduct. In a study on children's skin conductance reactions to fear-inducing and neutral film clips, Gilissen and colleagues (2008) showed that temperamentally more fearful children were more susceptible to both secure and insecure attachment relationships. More fearful children with a less secure relationship showed the highest reactivity to the fearful film clip, whereas comparable children with a more secure relationship showed the lowest reactivity. Klein Velderman and colleagues (2006) found that experimentally induced changes in maternal sensitivity exerted greater impact on the attachment security of highly negatively reactive infants than other infants. In the current study, therefore the potentially differential effectiveness of intervention was also tested for children with higher negative emotionality versus lower negative emotionality.

In sum, the main goal of the current study was to evaluate the effectiveness of a short-term interaction-focused video-feedback intervention implemented in families with mothers rated low in sensitive responsiveness. To our knowledge, this is not only the first attachment-based randomized control study in Eastern Europe (Lithuania) but also the first intervention study with non-clinical mothers specifically selected for their low levels of sensitivity.

Our first hypothesis is that low sensitive mothers can improve their sensitive responsiveness through participation in a short-term video-feedback intervention. The second hypothesis is that such an intervention may also impact on the infants showing more attachment security. Third, we hypothesized that the intervention would be more effective for infants with higher negative emotionality than for infants with lower negative emotionality.

## Method

### Sample

Mothers with their first-born infants were recruited from the three largest maternity hospitals in Vilnius, Lithuania. Mothers were contacted at the hospital 2 or 3 days after delivery and asked to participate in a study on mother–infant interaction. Six months later, 190 eligible mothers were visited at home and screened for sensitive responsiveness to their infants' signals during free play using Ainsworth's rating scale for sensitivity (Ainsworth *et al.* 1974). Mothers were also asked to complete some questionnaires.

Only mothers from intact families, who were primary caregivers to their infants, did not work until their children reached 12 months of age, and had at least high school education, were included in the intervention study. Mothers and infants were free of serious health problems.

In order to start intervention at 7 months after birth, a tentative evaluation of sensitive responsiveness was done on the basis of the 6-month video-recorded play interactions. For the purpose of evaluating maternal sensitivity more accurately, mothers who were tentatively classified as insensitive to their infants' signals were evaluated by a second coder. Fifty-four mothers out of 190 (28.4%) were evaluated as insensitive by both coders. Mothers who scored below the midpoint of 5 on Ainsworth's rating scale for sensitivity were considered 'insensitive'.

The 54 mothers and their infants (28 male and 26 female) were asked to participate in the intervention study. The mothers' mean age was 26.4 (SD = 2.94) years, they had had on average 16.8 (SD = 2.43) years of education (53.7% of mothers had college level education). Mothers were predominantly Lithuanian (77.8%), living in the Vilnius area. The mean age of the infants during the first home visit was 6 months and 12 days (SD = 0.07). Mothers were randomly assigned to the *intervention* ( $n = 26$ ) or *control* ( $n = 28$ ) groups. There were no statistically significant differences between the groups regarding infants' age and mothers' or fathers' years of education (see Table 1).

### Procedure

The control and intervention group mothers were contacted by phone when their infants were 7 months old. In order to create a 'dummy' intervention control group mothers were contacted by phone monthly for 5 months, and asked for information on their infants' development. No advice about sensitive parenting

**Table 1.** Means (M), standard deviations (SD), and associations with sensitivity and attachment security for the intervention and control groups at pre-test and post-test

	Intervention group <i>n</i> = 26 M (SD)	Control group <i>n</i> = 28 M (SD)	<i>t</i>	Correlations with sensitivity and attachment security		
				Sensitivity Pre-test	Sensitivity Post-test	Attachment Post-test
Pre-test						
Infant age (months)	6.12 (0.08)	6.11 (0.06)	-0.66	0.00	-0.07	-0.11
Maternal education (years)	17.15 (2.21)	16.39 (2.6)	-1.15	0.18	0.01	0.00
Paternal education (years)	16.12 (2.35)	15.70 (2.47)	-0.59	0.21	-0.08	-0.13
Sensitivity mother	4.09 (0.70)	4.1 (0.82)	0.06	-	0.22	0.30*
Depression mother	7.20 (4.50)	7.23 (4.35)	0.02	-0.17	-0.05	0.03
Infant positive affect	0.15 (0.09)	0.15 (0.08)	0.32	0.05	0.15	0.27
Infant negative affect	0.27 (0.19)	0.18 (0.16)	-1.75	-0.17	0.03	-0.20
Daily hassles (frequency)	43.46 (8.43)	44.28 (8.05)	0.37	0.02	-0.07	-0.17
Daily hassles (intensity)	28.5 (6.98)	29.21 (5.95)	0.40	-0.04	-0.08	-0.03
Post-test						
Sensitivity mother	5.25 (0.83)	4.63 (0.76)	-2.88**	0.22	-	0.45**
Attachment security	0.33 (0.22)	0.33 (0.19)	-0.02	0.30*	0.45**	-
Depression mother	5.51 (5.06)	6.79 (4.20)	1.01	-0.08	-0.06	0.01
Efficacy	4.17 (0.32)	4.06 (0.40)	-1.14	-0.01	0.32*	0.12
Daily hassles (frequency)	50.48 (9.76)	49.94 (10.33)	-0.20	-0.17	-0.07	-0.17
Daily hassles (intensity)	28.41 (4.64)	31.14 (8.11)	1.50	-0.14	-0.10	-0.26

\* $P < 0.05$ , \*\* $P < 0.01$  (two-tailed).

or attachment was given to the control group mothers during these conversations.

Parallel in timing, the intervention group mothers were visited monthly at home with a total of five intervention sessions, four sessions with mothers only according to the Leiden intervention protocol (see below), and one 'booster' session for mother and father together. During these sessions mother-child interactions were videotaped. After collecting video material to be used in the next home visit, feedback was given on the video fragments of the previous session. The duration of each session was approximately 90 min. Intervention mothers were informed that they were participating in a study of mother-infant interaction, but the intervention goal of the study was not specified. The intervention was implemented when the infants were between their seventh and 12th month of age.

The first intervention session was arranged approximately 1 month after the first home visit (which was part of the screening procedure and served as a pre-test), and videotaped interaction of this first home visit was used for video-feedback. Furthermore, mothers were asked to fill in a 'baby's diary' (St James-Roberts 1999), noting infants crying, fussing, sleeping, awake and satisfied behavioural states and caregivers' reactions to the infant (feeding, playing with him/her etc.) for three consecutive days. The 'baby's diary' was used in the next intervention session to discuss infants' crying behaviour.

When the children in both groups were 12 months old, their attachment security was evaluated on the basis of 3 h of home

observations (including a 15- to 20-min competing demand task for the mother during observation) with the Attachment Q-sort (AQS; Vaughn & Waters 1990) by a coder who was unaware of the intervention condition of the mothers and the results of the previous stages of the study. Moreover, videotaped observations of mother-infant free play at home were made in order to assess mothers' sensitive responsiveness. The intervention was conducted by two psychologists with a MA degree in clinical psychology (the first and the last author). One of the interveners was trained by the authors of the video-feedback intervention to promote positive parenting (VIPP) developed at Leiden University (Juffer *et al.* 2008). The other intervener was trained by the first author.

## Measures

### Maternal sensitive responsiveness

Ainsworth's 9-point rating scale for sensitivity (Ainsworth *et al.* 1974) was used to evaluate maternal ability to perceive and interpret baby's signals correctly and respond to them appropriately and promptly during 14 min of mother-infant free play at home, when infants were 6 (pre-test) and 12 months old (post-test). Mothers were given a set of eight toys and were instructed to play with their baby as they usually did for 7 min. For the next 7 min mothers were asked to play with their baby

without any toys. Inter-rater reliability among coders ranged from 0.72 to 0.86.

#### *Infant–mother attachment*

Infant–mother attachment security was assessed using Waters' Attachment Q-set (Version 3.0; Waters & Deane 1985) when infants were 12 months old (post-test). Trained observers blind to all other information about the participants visited mothers and infants at home and observed the dyads for 3 h. On the same day, the observer sorted the 90 items, describing the child's secure-base behaviour towards the mother (Waters & Deane 1985). The observer sorted the items into the nine piles ranged from 'not at all descriptive' of the child's behaviour (pile 1) to the 'strongly descriptive' (pile 9). The child's security score was obtained by correlating the child's Q-set description with the criterion sort, established by experts, for a prototypically secure infant (Waters 1995). The security scores range from +1.00 for the perfectly secure child to –1.00 for the most insecure child. The observer was instructed using special videotapes for training. Inter-coder reliability among three coders on tapes during training phase ranged from 0.75 to 0.85. One of the coders observed and assessed attachment security of all children in the study.

#### *Infant temperament*

Infant temperament was assessed by behaviour observation at home, when infants were 6 months old (pre-test). Mothers and infants participated in three procedures designed to elicit infants' positive and negative affect: face-to-face with a stranger, during a peek-a-boo game with the mother, and using the arm-restraint procedure. During the *face-to-face with the stranger procedure* the infant was exposed face-to-face to an unfamiliar adult at a close distance (approximately 30 cm) for 60 s. The stranger maintained a still face and did not interact with the infant. The infant's mother was present, but not engaged in this procedure. The *peek-a-boo game with the mother* was used to elicit positive affect (smiling and laughing) in the infant (Sroufe & Waters 1976; Stifter & Fox 1990). Mothers were instructed to interact normally with the infants and then prompted to play peek-a-boo for 90 s. Mothers were also encouraged to draw the infant's attention by making sounds, calling infant's name and smiling. The *arm-restraint procedure* was used to elicit the infant's distress or anger (Provost & Gouin-Decarie 1979; Stifter & Fox 1990). During the procedure the mother was sitting in front of the infant and holding down his/her arms for 30 s. The mother was instructed to maintain a still face and not to interact with the infant.

Infants' emotional and facial expressions in the three procedures were assessed from videotapes using a second-by-second strategy. Duration of positive affect (smiling, laughing) and distress (fussing, crying) was measured for all three procedures. Reliability between two coders for duration of positive and negative affect in the three procedures was established on 12 cases, kappa for positive affect was 0.74, for negative affect 0.93.

#### *Mothers' daily stress*

The Daily Hassles scale (Crnic & Greenberg 1990) was administered at pre-test (6 months) and post-test (12 months). Translation into Lithuanian was carried out by the first author. The questionnaire concerns daily events (20 items) in the family (being whined at, complained to, difficulties in getting the kid ready for outings on time, etc.). Mothers rated the frequency of occurrence of the events on a 5-point scale (never occurred, rarely, sometimes, a lot, constantly). On another 5-point scale they evaluated how hassled they felt by the event, starting from 1 – no hassle, ending to 5 – big hassle. Sum scores indicating the total frequency and the total intensity of daily stressful events were used. Alpha reliability at 6 months of age amounted to 0.71 for daily hassles frequency, and 0.82 for daily hassles intensity. At 12 months, 0.82 and 0.86 for daily hassles frequency and intensity, respectively, was found.

*Mothers' depression* was assessed using the Beck Depression Inventory (Beck *et al.* 1961, 1988). Each question is rated on a scale ranging from 0 to 3, indicating the intensity of the symptom. The total score indicates the intensity of depressive symptoms. The Beck Depression Inventory was administered to the mothers twice, when their infants were 6 months old (pre-test) and 12 months old (post-test). At 6 months, alpha reliability was 0.72, and at 12 months it amounted to 0.73.

#### *Mothers' perceived competence as a caregiver (efficacy)*

The Parental Efficacy Questionnaire (M. H. Van IJzendoorn *et al.* unpublished data) was used to measure the mothers' self-reported childrearing competence at the post-test (when infants were 12 months old). Alpha reliability was 0.85.

#### **Intervention**

The VIPP (Juffer *et al.* 2008) was applied according to the detailed protocol. The main goal of the intervention was to reinforce mothers' sensitive responsiveness to their infants' signals focusing on different aspects of mother–infant interactions (opportunities to focus on the baby's signals and

expressions, observational skills, empathy for the child, etc.). Additionally, mothers were provided with information on attachment-related issues by giving them brochures about sensitive parenting. Translations were made by bilingual Lithuanian translators.

Each intervention session focused on a different topic: the baby's contact seeking, playing, exploration and crying behaviour and possible reactions to it, understanding the feelings of the baby, sensitive responsiveness to the baby's signals, and sharing emotions. The last session was a booster session summarizing the previous ones: all important themes and messages were repeated.

In the beginning of each session an episode of mother–infant interaction (playing with the infant, cuddling, etc.) was videotaped. Then the mother was provided with personal video-feedback from the recording of the previous visit. She was supported whenever she showed moments of sensitive maternal behaviour. A mother's empathy and understanding of her baby's feelings and intentions were encouraged by 'speaking for the baby' (Carter *et al.* 1991). Corrective messages to the mother's behaviour were given in the third and later sessions of the intervention, preferably referring to instances of more sensitive behaviour already shown by the same mother (thus serving as her own model).

## Results

### Intervention effects on mothers' sensitive responsiveness

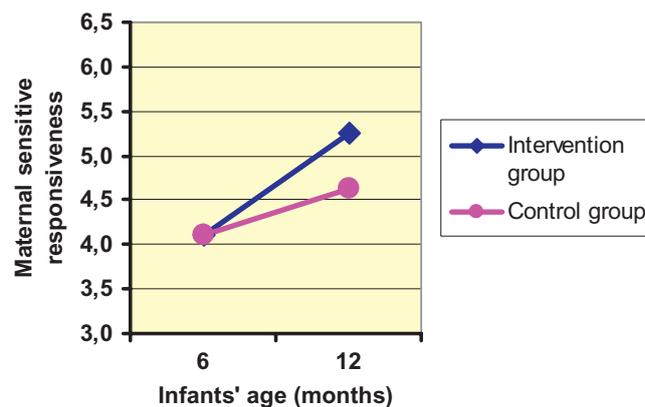
Means of maternal sensitive responsiveness, depression and daily hassles, and child attachment security and negative reactivity in the intervention and control group are presented in Table 1. Independent *t*-tests were computed to compare intervention and control group variables at pre-test and post-test. These analyses indicated no significant differences between intervention and control groups on sensitive responsiveness at the pre-test ( $t(52) = 0.06, P = 0.96$ ). There were no significant group differences on any of the other pre-test measures either. At the post-test intervention group mothers' sensitive responsiveness was significantly higher than that of controls,  $t(52) = -2.88, P = 0.01$ . This significant post-test difference in maternal sensitive responsiveness indicates that the VIPP intervention significantly improved maternal sensitivity.

A repeated measures analysis of variance with pre-test and post-test sensitive responsiveness as the repeated measure also showed that the intervention group mothers' sensitive responsiveness increased significantly compared with the control group mothers',  $F_{1,52} = 5.95, P < 0.02$ , 10% explained

variance (see Fig. 1). Controlling for pre-test differences and pre- to post-test stability of maternal sensitivity we found that intervention mothers showed more sensitive responsiveness than mothers who did not take part in the video-feedback sessions. The increase was substantial and amounted to almost one scale point or 10% of the variance in sensitive responsiveness.

Application of repeated measures analysis of covariance with sensitive responsiveness as repeated measure and one of following variables as covariates did not change the outcome of the intervention: Mothers' age, years of education, depression, daily hassles, and efficacy. Also, the inclusion of infant gender, negative and positive affect as a covariate yielded similar results.

From Table 1 it may be derived that at post-test maternal sensitive responsiveness was significantly correlated with maternal efficacy,  $r = 0.32, P = 0.02$ . In order to estimate the unique contribution of efficacy to predicting post-test sensitivity independent of the intervention, we performed a multiple regression analysis (Table 2). Maternal sensitive responsiveness pre-test, efficacy at post-test, and participation in the intervention were included as predictors of the variance in maternal sensitive responsiveness at post-test. Participating in the intervention ( $\beta = 0.33, P = 0.01$ ) and mothers' efficacy ( $\beta = 0.27, P = 0.03$ ) were significant predictors of sensitive responsiveness



**Figure 1.** Mothers' sensitive responsiveness in intervention and control group at pre-test and post-test.

**Table 2.** Multiple regression analysis predicting sensitive responsiveness at post-test

Sensitive responsiveness (post-test)	<i>r</i>	$\beta$	<i>B</i>	<i>t</i>
Participating in intervention	0.37**	0.33*	0.56	2.69*
Mothers' efficacy post-test	0.32**	0.27*	0.64	2.22*
Sensitive responsiveness pre-test	0.22	0.23	0.26	1.88

$R = 0.51; R^2 = 0.26, F_{3,50} = 5.92, P < 0.01$ .

\* $P < 0.05$ , \*\* $P < 0.01$ .

at the post-test. Twenty-six per cent of the variance in sensitivity at the post-test was predicted by these three independent variables.

### Intervention effects on children's attachment security

The hypothesis that the intervention group infants would show significantly higher attachment security than controls was not supported. At the post-test, intervention group children's mean attachment security score was equal to that in the control group,  $M = 0.33$  ( $SD = 0.22$ ) and  $M = 0.33$  ( $SD = 0.19$ ), respectively. The intervention effect was of course not significant,  $t(51) = -0.02$ ,  $P = 0.99$ .

It should be noted that at post-test the correlation between maternal sensitivity and infant attachment security was strong, in the control group,  $r = 0.53$ ,  $P < 0.01$ , as well as in the intervention group,  $r = 0.44$ ,  $P = 0.03$ .

### Intervention effects on highly reactive infants

For the purpose of testing Belsky's hypothesis of differential susceptibility to the intervention effects, we checked the differences in intervention effects on the sensitivity of the mothers of more reactive infants versus the mothers of infants with lower reactivity. Two groups of infants were formed on the basis of the duration of displayed negative affect during infant temperament evaluation procedures. The more reactive group consisted of infants who displayed more negative affect than average, and the less reactive group scored below average. Repeated measures analysis of variance on sensitive responsiveness with the condition (intervention vs. control) and infant reactivity (higher vs. lower) as factors did not show a differential effect for more versus less reactive infants,  $F_{1,50} = 0.53$ ,  $P = 0.47$ . The result indicated that mothers of more and less reactive infants equally profited from the intervention. In both reactivity groups the intervention showed significant effects on maternal sensitivity. In the more reactive group, the difference in maternal sensitivity between intervention and control groups was significant,  $t(25) = -2.14$ ,  $P = 0.04$ . In the less reactive group, the difference between intervention and control group mothers was also significant,  $t(25) = -2.07$ ,  $P = 0.049$ .

In a similar way we tested differential susceptibility in case of intervention effects on infant attachment security. The interaction effect of infants' reactivity (higher vs. lower) and condition (intervention vs. control) on infants' attachment security was not significant,  $F_{1,49} = 0.61$ ,  $P > 0.05$ . In both reactivity groups the intervention failed to enhance infants' attachment security.

Thus, we did not find support for the hypothesis that more negatively reactive infants would be more susceptible to intervention effects than less reactive infants.

## Discussion

To our knowledge, this is not only the first attachment-based randomized control study in Eastern Europe (Lithuania) but also the first intervention study with non-clinical mothers specifically selected for their low levels of sensitivity. The main purpose of this randomized control trial was to examine the effects of a short-term, interaction-focused and attachment-based video-feedback intervention (VIPP) on mothers' sensitive responsiveness and infant-mother attachment security in a sample of low sensitive mothers.

We found that low sensitive mothers indeed significantly improved their sensitive responsiveness through participation in our VIPP. The effect size was large according to Cohen's criteria,  $d = 0.78$ . That is, the VIPP mothers increased their sensitivity with 0.78 SD compared with the control group. This difference amounted to one scale point on the Ainsworth's 9-point rating scale for sensitivity. VIPP enhanced maternal sensitive responsiveness even when we controlled for maternal age, educational level, depression, daily hassles, efficacy, infant gender, and infant negative and positive affect. The large increase in sensitive responsiveness in the VIPP group as compared with controls is in line with several other studies in non-clinical as well as clinical populations (see for a review, Juffer *et al.* 2008). We may suggest that a relatively short (five sessions) and low-cost programme can provide effective support for mothers who lack sensitivity while interacting with their infants.

Infants, however, seem to profit less from VIPP. Although mothers' sensitivity appeared to be substantially associated with attachment security of their infants, at pre- and post-test, we did not find enhanced security in the VIPP infants after the intervention, compared with the control infants. Furthermore, infants' differential susceptibility to intervention effects was examined to test the hypothesis that highly reactive infants would be more susceptible to intervention effects than less reactive infants (Belsky *et al.* 2007). In the current study we did not find evidence for differential susceptibility to changes in the mothers' sensitivity. High as well as low reactive infants did not profit from VIPP-enhanced maternal sensitivity, at least not within the time frame of the current project. Of course, it cannot be excluded that in the long run the VIPP effects on maternal sensitivity may also affect infant attachment security, and may be more so in those infants who are

high on emotional reactivity, but the current study does not support the differential susceptibility theory. The short time frame of follow-up assessments might mask sleeper effects of the enhanced maternal sensitivity on infant attachment security, in the total experimental group as well as in the most reactive children.

Unexpectedly, we did not find enhanced attachment security of the infants in the intervention group compared with the control group. This converges with some previous studies (e.g. Klein Velderman *et al.* 2006), but it diverges from the findings of other investigations in this area (e.g. Cohen *et al.* 1999; Moran *et al.* 2005) where the positive impact of attachment-based intervention included a significant shift towards the infants' attachment security. Across attachment-based interventions, meta-analytical evidence suggests that maternal sensitivity is easier to enhance than infant attachment security (Bakermans-Kranenburg *et al.* 2003). However, the same series of meta-analyses also provided evidence that those intervention studies showing more change in the mothers also documented more positive change in infant attachment security (Bakermans-Kranenburg *et al.* 2003). Considering the large change in maternal sensitivity in the current intervention we had expected to find significant enhancement of infants' attachment security as well.

The composition of the sample may be one explanation. The only selection criteria for inclusion in the VIPP study was mothers' low sensitivity to infant signals as measured from video-recorded mother–infant free play. Selection on the basis of infant attachment would have created more opportunity for effective intervention. Average attachment security on the AQS (0.33) in the untreated control group was in the normal range of AQS scores in non-clinical populations (see Van IJzendoorn *et al.* 2004). Thus, our sample of middle class infants seemed to function in the normal range despite the low maternal responsiveness. This might be due to protective factors in these families (or the lack of additional risk factors), for example, the support of the partner in these two-parent families. It should also be noted that in the control group there was quite a substantial increase of maternal sensitivity amounting to more than half a scale point. Although only half showed the increase of sensitivity in the intervention group, this higher level of sensitivity may have been sufficient to have a threshold effect on attachment security at 12 months. It is possible that in these middle-class families protective factors were sufficiently adequate to facilitate a positive development of maternal sensitivity just beyond a threshold needed to improve the children's attachment security some months later, masking any possible programme effects on attachment.

In this respect it would be interesting to repeat the intervention study in a less well-educated and less socio-economically advantaged group, for example, in young, single mothers to see whether programme effects on attachment security could be detected. In intervention studies on children at high risk for deviant attachment development, for example, because of maltreatment, the effectiveness of attachment-based interventions on the level of children's functioning has been shown to be much easier to demonstrate (see Cicchetti *et al.* 2006). More risk factors may enlarge the possibility of positive change in infant attachment (Beckwith 2000; Ammaniti *et al.* 2006). In a clinical sample of preterm infants and infants suffering from dermatitis we found only positive effects on children's attachment security when mothers displayed insecure representations of their own childhood attachment experiences. For children of securely attached mothers VIPP intervention did not lead to more security of attachment (Cassibba *et al.* 2008).

We did not find significant differences in attachment security between the less and more reactive intervention infants, indicating that intervention infants of higher and lower reactivity equally profited from the intervention. Unexpectedly, we failed to find support for the theory of differential susceptibility. One of the reasons for the absence of evidence for differential susceptibility may be the age of the temperament assessment. Infant temperament was assessed through observation at the infant's home, when infants were 6 months old (pre-test). Mothers and infants participated in three procedures designed to elicit infants' positive and negative affect: face-to-face with a stranger, during a peek-a-boo game with the mother, and using the arm-restraint procedure. Although this observational procedure is more valid than using temperament questionnaires (Kagan 2007), the assessment should have been repeated after a few months in order to control for instability of temperament. It should also be noted that the current sample size is rather small for detecting interactions, and power is too low for finding more subtle signs of differential susceptibility.

One of the limitations of the current study is the assessment of attachment security with the observer AQS. Although it has been proven that the AQS belongs to the gold standards of attachment measures (Van IJzendoorn *et al.* 2004), the AQS fails to assess attachment disorganization. We do not know therefore whether the VIPP might have involved a decrease in attachment disorganization. It should be noted, however, that in our study we found rather strong associations between maternal sensitivity and infant attachment security, amounting to the association reported in a previous meta-analysis ( $r = 0.39$ , Van IJzendoorn *et al.* 2004), which certifies the validity of this assessment. Another limitation may be the restricted generalizability of the

VIPP effect on maternal sensitivity. In our sample we included only mothers who did not (yet) work outside their homes at the time of the intervention. This is an increasingly rare subgroup of mothers in western industrialized countries. Last, interventions may show sleeper effects, that is, effects only to be detected several months or even years after the last intervention session (for an example with VIPP, see Bakermans-Kranenburg *et al.* 2008). Changes in maternal behaviour may need time to be ingrained in the child's internal working model of attachment, and to be observed in interactive behaviour during the AQS.

In sum, our VIPP randomized control trial demonstrated the effectiveness of a relatively brief and cost-effective attachment-based intervention in increasing the level of maternal sensitivity to the signals of her infant. Our findings show the applicability of the attachment theory and its main measures in an Eastern European country (Lithuania), and they confirm the idea of selecting prospective participants in this kind of parent training programmes on the basis of their low levels of sensitive responsiveness. Even middle class parents without additional risk factors may profit from parenting support provided by VIPP.

### Key messages

- Intervention mothers significantly improved their sensitive responsiveness through participation in the VIPP.
- The effect size was large according to Cohen's criteria. VIPP enhanced maternal sensitive responsiveness even when maternal age, educational level, depression, daily hassles, efficacy, infant gender, and infant negative and positive affect were controlled for.
- Attachment security in infants was not enhanced after the intervention, compared with the control infants.
- The infants did not seem to be differential susceptible to the increase in maternal sensitivity dependent of their temperamental reactivity, but we suggest to assess temperament from a broader perspective in future studies.
- We suggest that a relatively brief (five sessions) and low-cost programme can provide effective support for mothers who lack sensitivity in the interactions with their infants.

### Acknowledgements

We thank the Vilnius Municipality, Health Department, and the Netherlands Organization for International Cooperation in Higher Education for their support to the first author. Support

from the Netherlands Organization for Scientific Research to the third author (NWO SPINOZA Prize) and to the fourth author (NWO VIDI grant) is gratefully acknowledged. We also acknowledge the financial support received from Wereldkinderen to Femmie Juffer. We thank Grazina Kasliejute and Dr Jantien van Zeijl. We also thank the Vilnius families for their participation.

### References

- Ainsworth, M. D. S., Bell, S. M. & Stayton, D. J. (1974) Infant-mother attachment and social development: Socialization as a product of reciprocal responsiveness to signals. In: *The Integration of a Child into a Social World* (ed. M. P. M. Richards), pp. 99–135. Cambridge University Press, London, UK.
- Ainsworth, M. D. S., Blehar, M., Waters, E. & Wall, S. (1978) *Patterns of Attachment: A Psychological Study of the Strange Situation*. Erlbaum, Hillsdale, NJ, USA.
- Ammaniti, M., Speranza, A. M., Tambelli, R., Muscetta, S., Lucarelli, L., Vismara, L., Odorisio, F. & Cimino, S. (2006) A prevention and promotion intervention program in the field of mother-infant relationship. *Infant Mental Health Journal*, 27, 70–90.
- Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H. & Juffer, F. (2003) Less is more: meta-analysis of sensitivity and attachment interventions in early childhood. *Psychological Bulletin*, 129, 195–215.
- Bakermans-Kranenburg, M. J., Van IJzendoorn, M. H., Pijlman, F. T. A., Mesman, J. & Juffer, F. (2008) Experimental evidence for differential susceptibility: dopamine D4 receptor polymorphism (DRD4 VNTR) moderates intervention effects on toddlers' externalizing behavior in a randomized trial. *Developmental Psychology*, 44, 293–300.
- Bandura, A. (1977) Self-efficacy: toward a unifying theory of behavior change. *Psychological Review*, 84, 191–215.
- Bandura, A. (1982) Self-efficacy mechanism in human agency. *American Psychologist*, 37, 122–147.
- Barnard, K. E., Magyary, D., Sumner, G., Booth, C. L., Mitchell, S. K. & Spieker, S. (1988) Prevention of parenting alterations for women with low social support. *Psychiatry*, 51, 248–254.
- Beck, A. T., Ward, C. H., Mendelson, M., Mock, J. & Erbaugh, J. (1961) An inventory for measuring depression. *Archives of General Psychiatry*, 4, 561–569.
- Beck, A. T., Steer, R. & Gorbin, M. (1988) Psychometric properties of the Beck Depression Inventory: 25 years of evaluation. *Clinical Psychological Review*, 8, 77–100.
- Beckwith, L. (2000) Prevention science and prevention programs. In: *Handbook of Infant Mental Health* (ed. C. H. Zeanah), pp. 439–456. Guilford Press, New York, NY, USA.
- Belsky, J. (1997) Theory testing, effect-size evaluation, and differential susceptibility to rearing influences: the case of mothering and attachment. *Child Development*, 68, 598–600.
- Belsky, J. (1999) Interactional and contextual determinants of attachment security. In: *Handbook of Attachment: Theory, Research,*

- and *Clinical Implications* (eds J. Cassidy & P. R. Shaver), pp. 249–263. The Guilford Press, New York, NY, USA.
- Belsky, J., Bakermans-Kranenburg, M. J. & Van IJzendoorn, M. H. (2007) For better and for worse: differential susceptibility to environmental influences. *Current Directions in Psychological Science*, **16**, 300–304.
- Berlin, L. J. & Cassidy, J. (2000) Parenting and attachment. In: *WAIMH Handbook of Infant Mental Health: Vol. 3. Parenting and Child Care* (eds J. D. Osofsky & H. E. Fitzgerald), pp. 137–170. Wiley, New York, NY, USA.
- Boyce, W. T. & Ellis, B. J. (2005) Biological sensitivity to context: I. An evolutionary-developmental theory of the origins and functions of stress reactivity. *Development and Psychopathology*, **17**, 271–301.
- Campbell, S. B., Brownelle, C. A., Hungerford, A., Spieker, S. J., Mohan, R. & Blessing, J. S. (2004) The course of maternal depressive symptoms and maternal sensitivity as predictors of attachment security at 36 months. *Development and Psychopathology*, **16**, 231–252.
- Carter, S. L., Osofsky, J. D. & Hann, D. M. (1991) Speaking for the baby: a therapeutic intervention with adolescent mothers and their infants. *Infant Mental Health Journal*, **12**, 291–301.
- Cassibba, R., Van IJzendoorn, M. H., Coppola, G., Bruno, S., Costantini, A., Gatto, S., Elia, A. & Tota, A. (2008) Supporting families with preterm children and children suffering from dermatitis. In: *Promoting Positive Parenting: An Attachment-based Intervention* (eds F. Juffer, M. J. Bakermans-Kranenburg & M. H. van IJzendoorn), pp. 134–162. Lawrence Publishers, Erlbaum Associates, London, UK.
- Cicchetti, D., Rogosch, F. A. & Toth, S. L. (2006) Fostering secure attachment in infants in maltreating families through preventive interventions. *Development and Psychopathology*, **18**, 623–649.
- Cohen, N. J., Muir, E., Lojkasek, M., Muir, R., Parker, C. J., Barwick, M., et al. (1999) Watch, wait, and wonder: testing the effectiveness of a new approach to mother-infant psychotherapy. *Infant Mental Health Journal*, **20**, 429–451.
- Coyl, D. D., Roggman, L. A. & Newland, L. A. (2002) Stress, maternal depression, and negative mother-infant interactions in relation to infant attachment. *Infant Mental Health Journal*, **23**, 145–163.
- Crnic, K. A. & Greenberg, M. T. (1990) Minor parenting stresses with young children. *Child Development*, **61**, 1628–1637.
- Crnic, K. A., Greenberg, M. T. & Slough, N. M. (1986) Early stress and social support influences on mothers' and high-risk infants' functioning in late infancy. *Infant Mental Health Journal*, **7**, 19–33.
- De Wolff, M. S. & Van IJzendoorn, M. H. (1997) Sensitivity and attachment: a meta-analysis on parental antecedents of infant attachment. *Child Development*, **68**, 571–591.
- Egeland, B., Weinfield, N. S., Bosquett, M. & Cheng, V. K. (2000) Remembering, repeating, and working through: lessons from attachment based interventions. In: *WAIMH Handbook of Infant Mental Health Vol. 4. Infant Mental Health in Groups at High Risk* (eds J. Osofsky & H. E. Fitzgerald), pp. 35–89. Wiley, New York, NY, USA.
- Feldman, R., Greenbaum, C. W. & Yirmiya, N. (1999) Mother-infant affect synchrony as an antecedent of the emergence of self-control. *Developmental Psychology*, **35**, 223–231.
- Gilissen, R., Bakermans-Kranenburg, M. J. & Van IJzendoorn, M. H. (2008) Parent-child relationship, temperament, and physiological reactions to fear-inducing film-clips: further evidence for differential susceptibility. *Journal of Experimental Child Psychology*, **99**, 182–195.
- Glaser, D. (2000) Child abuse and neglect and the brain- a review. *Journal of Child Psychology and Psychiatry*, **41**, 97–116.
- Gunnar, M. R. & Quevedo, K. (2007) The neurobiology of stress and development. *Annual Review of Psychology*, **58**, 145–174.
- Hsu, H. & Lavelli, M. (2005) Perceived and observed parenting behaviors in American and Italian first-time mothers across the first 3 months. *Infant Behavior and Development*, **28**, 503–518.
- Juffer, F., Bakermans-Kranenburg, M. J. & Van IJzendoorn, M. H. (2008) Methods of the video-feedback to promote positive parenting alone, with sensitive discipline, and with representational attachment discussions. In: *Promoting Positive Parenting: An Attachment-based Intervention* (eds F. Juffer, M. J. Bakermans-Kranenburg & M. H. Van IJzendoorn), pp. 22–36. Lawrence Erlbaum Associates, Publishers, London, UK.
- Kagan, J. (2007) *What Is Emotion?: History, Measures, and Meanings*. Yale University Press, New Haven, CT, USA.
- Klein-Velderman, M., Bakermans-Kranenburg, M. J., Juffer, F. & Van IJzendoorn, M. H. (2006) Effects of attachment-based interventions on maternal sensitivity and infant attachment: differential susceptibility of highly reactive infants. *Journal of Family Psychology*, **20**, 266–274.
- Kochanska, G., Aksan, N. & Joy, M. E. (2007) Children's fearfulness as a moderator of parenting in early socialization: two longitudinal studies. *Developmental Psychology*, **43**, 222–237.
- Martins, C. & Gaffan, E. A. (2000) Effects of early maternal depression on patterns of infant-mother attachment: a meta-analytic investigation. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, **41**, 737–746.
- Mertesacker, B., Bade, U., Haverkock, A. & Pauli-Pott, U. (2004) Predicting maternal reactivity/sensitivity: the role of infant emotionality, maternal depressiveness/anxiety, and social support. *Infant Mental Health Journal*, **25**, 47–61.
- Milgrom, J., Westley, D. T. & Gemmill, A. W. (2004) The mediating role of maternal responsiveness in some longer term effects of postnatal depression on infant development. *Infant Behavior and Development*, **27**, 443–454.
- Moran, G., Pederson, D. R. & Krupka, A. (2005) Maternal unresolved attachment status impedes the effectiveness of interventions with adolescent mothers. *Infant Mental Health Journal*, **26**, 231–249.
- Provost, M. A. & Gouin-Decarie, T. (1979) Heart rate reactivity of 9- and 12-month-old infants showing specific emotions in a natural setting. *International Journal of Behavioral Development*, **2**, 109–120.
- Scher, A. & Maysless, O. (2000) Mothers of anxious/ambivalent infants: maternal characteristics and child-care context. *Child Development*, **71**, 1629–1639.

- Sroufe, L. A. (2005) Attachment and development: a prospective, longitudinal study from birth to adulthood. *Attachment and Human Development*, 7, 349–367.
- Sroufe, L. A. & Waters, E. (1976) The ontogenesis of smiling and laughter: a perspective on the organization of development in infancy. *Psychological Review*, 83, 173–189.
- St James-Roberts, I. (1999) What is distinct about infants' 'colic' cries? *Archives of Disease in Childhood*, 80, 56–62.
- Stifter, C. A. & Fox, N. A. (1990) Infant reactivity: physiological correlates of newborn and 5-month temperament. *Developmental Psychology*, 26, 582–588.
- Teti, D. M. & Gelfand, D. M. (1991) Behavioral competence among mothers of infants in the first year: the mediational role of maternal self-efficacy. *Child Development*, 62, 918–929.
- Thompson, R. A. (1999) Early attachment and later development. In: *Handbook of Attachment: Theory, Research, and Clinical Implications* (eds J. Cassidy & P. R. Shaver), pp. 265–286. The Guilford Press, New York, NY, USA.
- Van IJzendoorn, M. H. (1995) Adult attachment representations, parental responsiveness, and infant attachment: a meta-analysis on the predictive validity of the adult attachment interview. *Psychological Bulletin*, 117, 387–403.
- Van IJzendoorn, M. H., Vereijken, C. M. J. L., Bakermans-Kranenburg, M. J. & Riksen-Walraven, J. M. (2004) Assessing attachment security with the attachment Q sort: meta-analytic evidence for the validity of the observer AQS. *Child Development*, 75, 1188–1213.
- Vaughn, B. E. & Waters, E. (1990) Attachment behavior at home and in laboratory: Q-sort observations and Strange Situation classification of 1-year-olds. *Child Development*, 61, 1965–1973.
- Waters, E. (1995) The attachment Q-set. In: *Caregiving, Cultural, and Cognitive Perspectives on Secure-Base Behavior and Working Models. Monographs of the Society for Research in Child Development* (eds E. Waters, B. E. Vaughn, G. Posada & K. Kondo-Ikemura), pp. 247–254. Wiley-Blackwell, Hoboken, NJ, USA.
- Waters, E. & Deane, K. (1985) Defining and assessing individual differences in attachment relationships: Q-methodology and the organization of behavior in infancy and early childhood. In: *Growing Points of Attachment: Theory and Research. Monographs of the Society for Research in Child Development* (eds I. Bretherton & E. Waters), pp. 41–65. Wiley-Blackwell, Hoboken, NJ, USA.