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Objective: This study examined the effectiveness of hospital-based Video Interaction Guidance (VIG; Eliëns, 2010; Kennedy, Landor, & Todd, 2011) for mothers and fathers of infants born preterm (25–37 weeks of gestation). ***Method:*** VIG is a preventive video-feedback intervention to support the parent–infant relationship. One hundred fifty families (150 infants, 150 mothers, 144 fathers) participated in a pragmatic randomized controlled trial to evaluate the effects of VIG as adjunct to standard hospital care. Primary outcome was parental interactive behavior (sensitivity, intrusiveness, and withdrawal) as observed in videotaped dyadic parent–infant interaction. Secondary outcomes comprised parental bonding, stress responses, and psychological well-being based on self-report. The intervention effects were assessed at baseline, mid-intervention, 3-week, 3-month, and 6-month follow-ups. Data were analyzed on an intention-to-treat basis, using multilevel modeling and analyses of covariance. ***Results:*** VIG proved to be effective in enhancing sensitive behavior and diminishing withdrawn behavior in mothers (Cohen's *d* range = .24–.44) and in fathers (*d* range: .54–.60). The positive effects of VIG were particularly found in mothers who experienced the preterm birth as very traumatic (*d* range = .80–1.04). The intervention, however, did not change parents' intrusive behavior. Analyses additionally revealed positive effects on parental bonding, especially for fathers, yet no significant effects on stress and well-being were detected. ***Conclusions:*** The results indicate that VIG is a useful addition to standard hospital care, reducing the possible negative impact of preterm birth on the parent–infant relationship. VIG appeared particularly beneficial for fathers, and for mothers with traumatic birth experiences. High levels of parental intrusiveness, however, need complementary intervention.

What is the public health significance of this article?
This study suggests that hospital-based Video Interaction Guidance is an effective intervention to support the early parent-infant relationship after preterm birth, especially after traumatic preterm birth. For parents with highly intrusive behavior, additional support may be necessary.

Keywords: video interaction guidance, preterm birth, parent–infant interaction, bonding, stress

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Preterm childbirth is a major public health issue, as it is a leading cause of neonatal mortality and morbidity and incidence rates continue to rise around the world (March of Dimes, PMNCH, Save the Children, & WHO, 2012). Due to advances in perinatal and neonatal care, infants with short gestations have an increasingly good chance of survival in developed countries. Yet these infants born at the threshold of viability are at risk for a variety of health problems, as well as for cognitive and socioemotional difficulties. Consequently, there is a growing concern for the impact of preterm birth on infants, parents, and public health care systems (McCormick, Litt, Smith, & Zupancic, 2011).

Preterm birth can be a very traumatic event, posing challenges to the infant as well as the parents (Karatzias, Chouliara, Maxton, Freer, & Power, 2007). For infants, the impact of the preterm birth is determined by several interrelated biological and psychosocial factors. First, the health status of the infant critically influences the infant's survival chances, developmental outcomes, and future quality of life. In addition, parents' limited abilities to cope with preterm childbirth and their responses to the infant's needs affect the infant's capabilities and development (Maroney, 2003). For parents, the stressors that are particularly related to preterm birth include the infant's physical condition, early separation from the infant, uncertainty about the infant's outcome, and anticipated loss (Goldberg & DiVitto, 2002). Several studies have shown that these stressors can lead to feelings of anxiety, depression, frustration, distress, and even symptoms of traumatization in parents (Müller-Nix & Ansermet, 2009; Obeidat, Bond, & Callister, 2009). As thoughts and feelings shape behavior, these intense emotions in their turn can affect the process of parental bonding, the establishment of an affectionate parent–infant relationship (Flacking et al., 2012), and consequently the parents' interaction style (Forcada-Guex, Borghini, Pierrehumbert, Ansermet, & Müller-Nix, 2011). More specifically, the event of preterm birth can cause some parents to turn away from their infant (i.e., withdrawn interactive behavior) or, alternatively, to overstimulate their infant in an attempt to receive a reassuring response (i.e., intrusive interactive behavior) (Davis, 2003).

To prevent future problems in the parent–preterm infant relationship, attention should be directed toward early parenting behaviors and the role of the parent during hospitalization of the infant. Provision of sensitive parental care and handling while the infant is in hospital is deemed important for the preterm infant's well-being and development, particularly because of the immaturity, vulnerability, and sympathetic arousal of preterm infants (Kinney, 2006; VandenBerg, 2008). Moreover, the quality of early parenting is considered to be a significant mediating factor between the infant's perinatal risk status and developmental outcomes (Forcada-Guex, Pierrehumbert, Borghini, Moessinger, & Müller-Nix, 2006; Singer et al., 2003). This applies to parents of very preterm and moderately preterm infants, because moderately preterms also account for a substantial proportion of hospital admissions, and both populations are at increased risk of neonatal morbidity (Engle, Tomashek, & Wallman, & the Committee on Fetus and Newborns, 2007).

Most hospitals in industrialized countries provide high-quality family centered care to prevent negative outcomes in the parent–preterm infant relationship, in particular for high-risk families. During the infant's hospitalization, the parent–infant relationship is supported by means of standard care options such as kangaroo care (skin-to-skin contact), and additional interventions like video interaction guidance (VIG; Eliëns, 2010; Kennedy, Landor, & Todd, 2011). Hospital-based VIG is a short-term, nonintrusive, behaviorally focused, preventive video-feedback intervention, which aims to facilitate parental bonding, attuned parental interactive behavior, and well-being in parents at an early stage using edited video recordings of parent–infant interactions (Eliëns, 2010; Kennedy et al., 2011). From an attachment perspective it is suggested that there is a unique salience about the early developmental period for an intervention that supports parental responsiveness behaviors such as warm sensitivity and positive affect in parents with biologically at-risk infants (Landry, Smith, Swank, & Guttentag, 2008). However, the effectiveness of VIG has not yet been empirically evaluated among parents of preterms.

Promising effects have been reported in earlier studies evaluating video-feedback interventions. Bakermans-Kranenburg, van IJzendoorn, and Juffer (2003) showed that behaviorally focused programs with a relatively short duration (i.e., less than five sessions) are especially effective in promoting parental sensitivity. Moreover, in particular interventions that make use of video feedback are successful in changing parental behavior in both high- and low-risk families with young children (Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003; Fukkink, 2008). The meta-analysis of Fukkink (2008) revealed positive effects of video-feedback interventions on the quality of parent–infant interactions, parental attitudes, as well as on infant development. The author concluded that video-feedback interventions that were primarily focused on parenting behavior were as effective as interventions focusing on both behavior and mental representations in parents. Delayed video feedback (with selection of edited images and careful preparation of the presentation and discussion) proved to be the most appropriate technique in clinical settings.

The present study is the first to empirically evaluate the effectiveness of hospital-based VIG in parents, that is, mothers and fathers, with moderately and very preterm infants, using a pragmatic, multicenter, randomized controlled trial (RCT) design. Compared with other video-feedback interventions, the main assets of hospital-based VIG are the early timing of the intervention (at the start of the parent–infant relationship), the relatively short duration with a small number of sessions, and the use of edited recordings to provide feedback. We thus hypothesized that VIG in the first week after birth would prevent adverse parental interactive behavior, enhance parental bonding, and diminish parental psychological stress responses. In addition, we focused on a subset of mothers who perceived the preterm birth as a traumatic event, because earlier studies have suggested that maternal traumatic birth experiences can interfere with a mother's ability to recognize, read, and sensitively respond to the behavioral cues of her newborn (Forcada-Guex et al., 2011; Müller-Nix et al., 2004; Pierrehumbert, Nicole, Müller-Nix, Forcada-Guex, & Ansermet, 2003; Shaw et al., 2006). We anticipated that these mothers in particular would benefit from a supportive intervention that focused on positive parent–infant communication by encouraging parental awareness of and responsiveness to infant cues and behavior.

Method

This study was part of a larger longitudinal research project on parents with preterm infants, conducted between September, 2009

and September, 2012 (Tooten et al., 2012). The primary aim of the study was to prospectively evaluate the effectiveness of hospital-based VIG in parents of preterm infants by means of a pragmatic, multicenter RCT design with two parallel arms (Netherlands Trial Registration No.: NL24021.060.08). The study protocol received ethical approval by the Medical Ethical Committee of the Catharina Hospital in Eindhoven, the Netherlands. In addition, local feasibility approval was obtained from all participating hospitals.

Recruitment and Screening Procedure

In seven hospitals in the Netherlands, couples with an infant born preterm (born at less than 37 weeks of gestational age (GA), were invited to participate in the study. Parents with moderately preterm infants (≥32–<37 weeks GA) were recruited from seven maternity wards and parents with very preterm infants (<32 weeks GA) were approached at two neonatal intensive care units (NICUs). Parents were eligible to participate if they had had a preterm hospital delivery. A poor understanding of the Dutch language and previous experience with a video-feedback intervention were exclusion criteria. Written informed consent was obtained from all parents enrolled in the study. Eligible parents were invited personally by nurses to participate before the delivery or within 24 hr after birth. Parents were informed about the design and aims of the study with an information brochure. It was emphasized that participation was voluntary, without any financial compensation, and that they were free to withdraw from the study at any time. Informed consent was obtained from both parents before allocation to the intervention or control group.

Allocation Strategy and Treatment Conditions

The participating families (i.e., mother, father, and infant) were randomly assigned in a 1:1 ratio to either the intervention group or the control group using computerized random numbers. The prespecified allocation sequence was concealed from the nurses involved in participant enrollment. Randomization was stratified by hospital and GA (<32 weeks or ≥32–<37 weeks) to ensure balance by region and degree of the infant's prematurity. After parents gave their informed consent, a VIG nurse opened one of the sequentially numbered, sealed envelopes to reveal the treatment assignment.

Standard Hospital Care

All participating families received standard hospital care. All Dutch hospitals offer comparable high-quality individualized family-centered developmental standard care, and cater to a population of similar social class. The Dutch guidelines regarding perinatal care after preterm birth (2010) recommend compassionate family centered care at <24 weeks GA, and active care at >24 weeks GA. In both intensive care and medium care units, parent visitation is permitted 24 hr a day. Obviously, for very prematurely born infants, the hospital care is more intensive and more closely monitored, compared with care for moderately preterm infants. The development of a positive and affectionate parent–infant relationship is actively promoted and supported. Parents are encouraged to be actively involved in the daily care of their infant. Parents are not only frequently informed about the health status and medical progress of their infant, but also about their infant's signals and responsiveness. The developmentally supportive hospital care involves several standard options, such as kangaroo care, lactation consultations, and psychological support for parents.

The Intervention: Video Interaction Guidance

VIG is a short term, nonintrusive, behaviorally focused, preventive video-feedback intervention that guides parents to reflect on their own successful interactions. The basic assumption is that every newborn, even if he or she is born (very) preterm, seeks contact with the parent. Video recordings of parent–infant interaction and the feedback from a VIG professional provide an opportunity for parents to observe, analyze and discuss the infant's behavior and contact initiatives (Eliëns, 2010; Kennedy et al., 2011). The intervention aims to facilitate parental bonding, to enhance the quality of parental interactive behavior, and to promote parental well-being using edited video recordings of parent–infant interactions (Eliëns, 2010; Kennedy et al., 2011). Two core concepts are at the basis of VIG (Biemans, 1990): (a) *intersubjectivity*, which refers to a two-way interactional process between parent and infant because attuned and sensitive interactions are essential for a harmonious and responsive relationship (Murray & Trevarthen, 1985) and (b) *mediated learning*, which refers to the guided process of video reviewing during which parents receive positive feedback on their intuitive parenting behaviors (Bandura, 1977; Papoušek & Papoušek, 1987).

VIG in the clinical setting is performed by certified professionals (i.e., trained nurses and pedagogic workers) who work according to a standardized protocol when (a) video recording parent–infant interaction, (b) editing the recordings, and (c) reviewing the edited recordings with parents (Eliëns & Prinsen, 2008). The video recordings of approximately 15 min duration are made during daily moments of caregiving (e.g., bathing, changing, and feeding). The interaction guide strives to record spontaneous and natural elements of basic parent–infant communication, with special attention to eye contact, mirroring, and imitation. The recordings are subsequently edited by the VIG professional, who selects micromoments of the infant's contact initiatives and parents' positive responses to these signals. Finally, parents are invited to review these moments and to discuss them with the VIG professional. During the review, parents are asked to reflect actively on the nature and details of their interactions. Freeze frames (still images) are used to accentuate the successful moments of mutual parent–infant interaction and to provoke a discussion with the parents. This procedure of filming, editing, and shared review with the parents is repeated, as VIG usually consists of three recording and reviewing sessions, on average. The positive feedback loop generated by watching the video recordings is expected to improve effective communication between parent and infant, and sets goals for the next recording day.

In the present study, VIG consisted of three sessions during the first week after birth. Consequently, not only parents of very preterm infants, but also of moderately preterm infants were able to complete the full intervention program while their infants were hospitalized. The intervention was delivered by circa 25 certified hospital-employed VIG professionals. Parents in the intervention group were videotaped at the 1st, 3rd, and 6th day postpartum, and received feedback the day after the recordings were made. Both

parents were present during the video recordings and review sessions. The VIG (filming, editing, and reviewing) was applied according to protocol and similar for all parents (Eliëns & Prinsen, 2008), whereas the feedback during the shared review sessions was adjusted to the specific needs of family (i.e., tailored to the parents' questions, their wishes, and their mental states at and during every session). Treatment fidelity checks were performed by the national coordinator and supervisor of VIG, who provided regular supervision to the interaction guides to ensure adherence to the intervention protocol.

Participants

A total of 157 eligible families with preterm infants agreed to participate in the study, of which 150 families ($n = 150$ infants, with $n = 150$ mothers and $n = 144$ fathers) were randomized to either the intervention ($n = 75$) or control group ($n = 75$). Slightly more mothers than fathers participated in the study, as six mothers were living without a partner. Unfortunately, it was not feasible to determine the exact number of families eligible for trial participation. Figure 1.1 shows the participant flow diagram of the study with the number of families through each stage of the trial. All families enrolled in the study received the intended treatment. All participants (mothers and fathers) allocated to the intervention group attended at least one VIG session, 100% of the mothers and 93% of the fathers attended at least two sessions, and 95% of the mothers and 83% of the fathers attended all three VIG sessions. Six months postpartum, the proportion of families lost to follow-up was 10%. Throughout the study, dropout rates were comparable for the intervention group (10.7%) and control group (9.3%). The randomized participants were all retained in the analyses of the data according to the intention-to-treat principle.

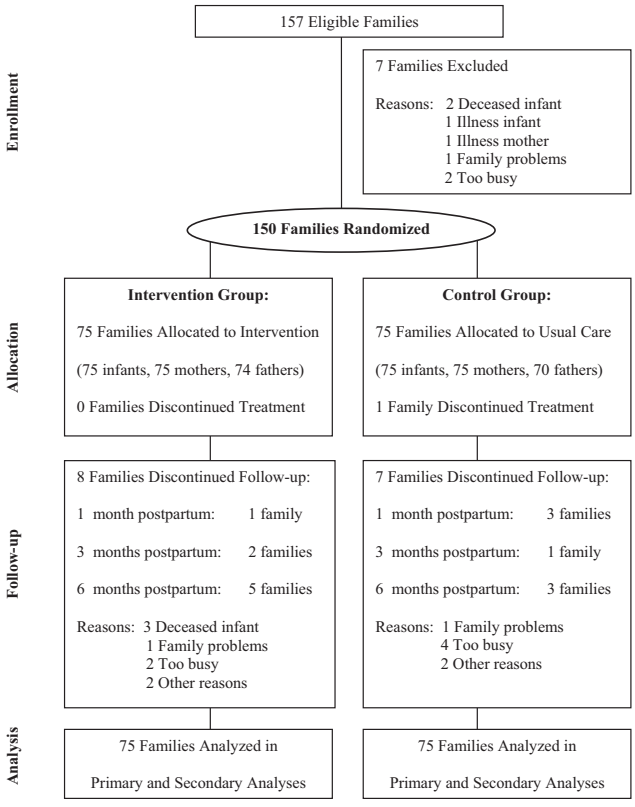

Figure 1. Participant flow.

Outcome Measures

Parental interactive behavior. The effects on the main outcome, parental interactive behavior, were evaluated by means of 15-min video recordings capturing behavioral observations of daily dyadic parent–infant interaction. Videos were recorded at 1 day postpartum (i.e., T0, postrandomization and pre-intervention baseline measurement), 6 days postpartum (i.e., T1, mid-intervention measurement, after two VIG reviews), 1 month postpartum (i.e., T2, 3 weeks postintervention) and 6 months postpartum (i.e., T3, 6 months postintervention). Parent–infant triads were videotaped at the hospital or at the participants' home. Both mother–infant and father–infant interactions were captured on video. At T0, T1 and T2 recordings were made during daily moments of caregiving (e.g., bathing, changing, and feeding), whereas at T3, parents were provided with a standard set of toys and were asked to play with their child freely for 15 min. Manualized decision rules were used to quantify the verbal and nonverbal interactional behaviors of mothers and fathers.

The videotaped observations were rated by means of the coding scheme developed by the U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Child Health and Human Development Early Care Research Network (NICHD, 1999; Ravn et al., 2011). Minor adaptations were made to the original instrument to make it applicable to our population of parents with preterm infants, as well as for scoring parent–infant interaction at a very early stage (e.g., for scoring parental interaction with a medically fragile infant staying in an incubator). The ratings were assigned at six 4-point global rating scales (range = 1–4) which were subsequently clustered into three composite scores. The subscales Sensitivity to Nondistress and Positive Regard for the Infant were combined into the composite score for Parental Sensitivity. The subscales Intrusiveness and Negative Regard for the Infant were combined to assess Parental Intrusiveness. The subscales Detachment and Flatness of Affect were combined to evaluate Parental Withdrawal. All composite scores for parental interactive behavior ranged from *very uncharacteristic* to *very characteristic* interactive behavior on a 7-point scale (range = 1–7).

The videotapes were assessed by independent coders who were blind to each participant's group affiliation. Prior to scoring the video observations, all coders received standardized training for reliability, along with regularly scheduled supervision during the process of coding. Approximately 15% of the videos were randomly selected and double coded. Intraclass correlation coefficients (ICC) for interrater agreement were .67 and .69 for maternal and paternal sensitivity, .78 and .73 for maternal and paternal intrusiveness, and .67 and .64 for maternal and paternal withdrawal respectively.

Parental bonding, stress, and psychological well-being. The secondary outcomes, i.e., parental bonding, stress responses, and psychological well-being, were all examined by means of self-report measures. Parents individually completed a set of ques-

tionnaires at four measurement occasions: at 1 week (W1), 1 month (M1), 3 months (M3) and 6 months (M6) postpartum.

The 25-item Postpartum Bonding Questionnaire (PBQ; Brockington et al., 2001), completed at M1 and M6, was designed to diagnose early disorders in the parent–infant relationship and comprises the subscales Impaired Bonding, Rejection and Anger, Infant-Focused Anxiety, and Incipient Abuse. In the present study, we used the sum score (range = 0–125). High scores are indicative of serious parental problems in bonding with the infant. The PBQ is a reliable (mothers: α = .74 and .67, fathers: α = .80 and .80) and valid measure, with the exception of the subscale on Risk of Abuse (e.g., Wittkowski, Wieck, & Mann, 2007).

The My Baby and I questionnaire (MBI; Furman & O'Riordan, 2006), completed at W1 and M3, assesses the parent–infant relationship, comprising the areas Worry (MBI-W; 3-items, range = 3–15), Enjoyment and Responsiveness (MBI-ER; 7-items, range = 7–31) and Separation Anxiety (MBI-SA; 4-items, range = 4–20). Higher scores indicate greater infant-related concern, more positive feelings about and responsiveness to the infant, or greater parental anxiety on leaving the infant. Internal consistency in the current sample ranged from acceptable to very good across the dimensions MBI-W (mothers: α = .90 and .77, fathers: α = .88 and .75), MBI-ER (mothers: α = .83 and .60, fathers: α = .83 and .67), and MBI-SA (mothers: α = .70 and .82, fathers: α = .70 and .75).

The questionnaire version of the Yale Inventory of Parental Thoughts and Actions (YIPTA; Feldman, Weller, Leckman, Kuint, & Eidelman, 1999), completed at M1, assesses aspects of parental bonding and distress in the postpartum period. The subscales Frequency of Thoughts and Worries (YIPTA-FTW; 9 items, range = 0–36), Distress Caused by Thoughts and Worries (YIPTA-DTW; 5-items, range = 0–20), Compulsive Checking (YIPTA-CC; 4-items, range = 0–16), Affiliative Behavior (YIPTA-AB; 5-items, range = 0–20) and Attachment Representations (YIPTA-AR; 4-items, range = 0–16) were included. Higher scores indicate intensified infant-related worries and distress since childbirth, or enhanced bonding and caregiving behaviors. The YIPTA has been validated in studies with parents of term and preterm infants (Feldman, Gordon, & Zagoory-Sharon, 2011). In the present sample, the scale demonstrated good to excellent internal consistency for YIPTA-FTW (mothers: α = .92, fathers: α = .90), YIPTA-DTW (mothers: α = .87, fathers: α = .86), and YIPTA-CC (mothers: α = .81, fathers: α = .77), and a mediocre level of consistency for YIPTA-AB (mothers: α = .55, fathers: α = .66) and YIPTA-AR (mothers: α = .55, fathers: α = .59).

The 34-item Parental Stress Scale: Neonatal Intensive Care Unit (PSS:NICU; Miles, Funk, & Carlson, 1993), completed at W1, gauges parental stress responses related to the hospital environment. To apply the instrument in a population of both moderately and very preterm infants, parents were asked to rate the items on five point Likert scales, ranging from *not experienced* (1) or *not stressful* (1) to *extremely stressful* (5). The instrument was subsequently scored on Metric 2, "the overall stress level." The sum score of the measure was used (range = 34–170), with higher scores reflecting a higher stress level. In previous studies the PSS:NICU demonstrated appropriate psychometrics, in terms of reliability, construct and concurrent validity (Franck, Cox, Allen, & Winter, 2005). The data of the current sample established very good internal consistency of the measure (mothers: α = .94, fathers: α = .94).

The 10-item Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), the 20-item *State–Trait Anxiety Inventory* (STAI-State; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) and the 15-item *State-Trait Anger Expression Inventory* (STAXI2-State; Spielberger, 1999), completed at M1, assess feelings of postnatal depression, state anxiety, and state anger in parents. Higher scores indicate more depressive symptoms (range = 0–30), higher levels of anxiety (range = 20–80), and anger (range = 15–60) as an emotional state. These widely used questionnaires have been verified as reliable and valid screening instruments to detect symptoms of depression, anxiety, and anger in various populations (Eberhard-Gran, Eskild, Tambs, Opjordsmoen, & Samuelsen, 2001; Spielberger, & Reheiser, 2004). The internal consistency estimates in the present sample were good to excellent for the EPDS (mothers: α = .87, fathers: α = .76), the STAI-State (mothers: α = .94, fathers: α = .93), and the STAXI2-State (mothers: α = .92, fathers: α = .87).

Maternal trauma. In addition to the main analyses, mothers' experience of psychological trauma in childbirth was examined for subgroup analysis using the four stressor items of the Traumatic Event Scale (TES; Criterion A) (Wijma, Soderquist, & Wijma, 1997; Soet, Brack, & Dilorio, 2003). The TES stressor items were scored on 4-point rating scales ranging from *not at all* (1) to *very much* (4). Mothers completed the four questions within 24 hr after delivery (i.e., T0, after randomization and pre-intervention baseline measure). To differentiate between mothers who perceived the preterm birth as traumatic, and mothers who did not perceive it as traumatic, mothers' responses were examined according the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.), 1994, Washington, DC event criteria. For the experience of preterm childbirth to be classified as traumatic, both the "threat" and the "emotional response" criteria had to be met, i.e., a response of *much* (3) or *very much* (4). The threat criterion was met if the preterm childbirth was qualified by the mother as a trying experience (Item 1) or as a threat to the physical integrity of herself or her baby (Item 3). The emotional response criterion was met if the mother felt physically offended or violated during delivery (Item 2) or if she experienced feelings of intense fear, helplessness, or horror (Item 4). Since questionnaires assessing the psychological impact of childbirth typically only include event criteria specific to mothers' experiences, we did not examine fathers' postpartum traumatic responses in the current study.

Sample Size

The study's target sample size was based on the primary outcome variable, parental sensitivity, using the scale scores of Sensitivity to Nondistress and Positive Regard for the Infant (NICHD, 1999; Ravn et al., 2011). Based on previous studies on the quality of parent–infant interaction, we considered a difference of .50 *SD* and .75 *SD* between the intervention and control group as clinically meaningful (NICHD SECCYD, n.d.). Assuming a mean score and standard deviation of M = 3.23, SD = .77 for Sensitivity to Nondistress, a sample size of 29 (considering a .75 *SD*) to 63 (considering a .50 *SD*) participants in each group would provide 80% power to identify a clinically significant difference on paren-

tal interactive behavior at a two-sided 5% significance level. A mean score and standard deviation of $M = 3.69$, $SD = .57$, for the subscale Positive Regard for the Infant would result in a needed sample size of 28 (considering a .75 *SD*) to 63 (considering a .50 *SD*). This number has been increased to 75 per study group, taking into account the anticipated dropout rate (15%).

Statistical Analyses

To evaluate the added value of VIG treatment as an adjunct to standard hospital care, the mean differences in outcomes on parental interactive behavior, bonding, stress, and psychological well-being were examined between the intervention and control group. In addition, subgroup analyses on interactive behavior and bonding problems were performed in mothers who had experienced the preterm childbirth as a traumatic event. All endpoints of the study were analyzed on an intention-to-treat basis to maintain the integrity of randomization. In all analyses, the infants gestational age at birth, parental educational level, and parity were included as time-invariant covariates. Outcomes were analyzed separately for mothers and fathers. In case of twins ($n = 28$), only outcomes regarding the firstborn infant were included in the analyses. Because random treatment allocation can still lead to chance fluctuations, the demographic and clinical characteristics of the intervention and control group (see Table 1) were compared at baseline using *t* tests for continuous variables and χ^2 analyses for categorical variables. Study groups did not differ on demographic or clinical background characteristics at trial entry.

Table 1
Demographic and Clinical Characteristics of Sample by Treatment Condition

Demographic	Intervention group $n = 75$ families	Control group $n = 75$ families
Infant medical data, *n*	75	75
Male sex, %	57.3	54.7
Twins, %	13.3	24.0
GA at birth, wk	32 (3.1)	32 (3.1)
GA at birth, range	25–37	25–37
Birth weight, g	1828 (735)	1770 (663)
Birth weight, range	556–4280	592–3770
5-min APGAR	8.7 (1.4)	8.3 (1.7)
Incubator, d	22.5 (20.7)	23.4 (24.8)
Mortality, %	4.0	1.3
Maternal demographic data, *n*	75	75
Maternal age at birth, year	31.1 (4.9)	30.8 (5.4)
Birth order	1.4 (0.6)	1.2 (0.5)
Dutch nationality %	92.0	93.3
Education level[a]	2.2 (0.7)	2.2 (0.8)
Paternal demographic data, *n*	74	70
Paternal age at birth, year	34.1 (5.4)	33.6 (5.5)
Birth order	1.5 (0.7)	1.3 (0.7)
Dutch nationality %	89.2	92.9
Educational level[a]	2.1 (0.9)	2.3 (0.8)
Single/divorced parents[b], *n*	2	5

Note. GA = gestational age; values are expressed as mean (*SD*) unless otherwise indicated.
[a] Educational level was classified as *low*, 1; *medium*, 2; *high*, 3. [b] Single/divorced parents: i.e., one divorced couple (both mother and father participated in the study), and six single mothers (only the mothers participated in the study).

Parental Interactive Behavior

The effect of VIG on the repeatedly measured parental interactive behavior was examined by means of multilevel modeling (MLM) using the linear mixed-effects procedure in SPSS with maximum likelihood (ML) estimation (Curran, Obeidat, & Losardo, 2010; Heck, Thomas, & Tabata, 2010). The analyses were performed on the composite scores for parental sensitivity, intrusiveness and withdrawal, as observed in the videotapes of parent–infant interaction. In MLM statistical analysis of longitudinal data, the measurement occasions are nested within individuals. By modeling the variances and covariances, MLM allows for the estimation of interindividual differences in intraindividual patterns of change over time. Moreover, the MLM approach can accommodate missing data points under the assumption that data are missing at random (MAR). To compare the fit of successive models, likelihood ratio tests were used in combination with changes in Akaike's information criterion (AIC; smaller criterion values indicate better model fit to the data). To evaluate the intervention effects for mothers who experienced the preterm childbirth as traumatic, additional subgroup analyses were performed.

Parental Bonding, Stress and Psychological Wellbeing

Analyses of covariance (ANCOVA) were used to compare the intervention and control group for outcomes on parental bonding, stress responses and psychological wellbeing. The method of multiple imputation (MI; generating 40 multiple imputed datasets) was applied to account for missing data in the analyses. To evaluate the intervention effects for mothers who experienced the preterm childbirth as traumatic, additional subgroup analyses were performed on the PBQ subscore as the main bonding outcome.

Results

Parental Interactive Behavior

For the composite scores of parental sensitivity, intrusiveness, and withdrawal, sequences of increasingly more extensive multilevel models were evaluated: the intercept-only or unconditional means model (empty, Model A), the unconditional growth model (empty time, Model B), a conditional growth model (+covariates, Model C) and an intervention moderated conditional growth model (+Time × Intervention, Model D; Singer & Willet, 2003). Table 2 provides a summary of the model fit of these multilevel models for parental interactive behavior. We discuss the results in more detail in the next paragraphs.

In a first analytic step, unconditional means models (Model A) were used to evaluate the amount of variability in parental interactive behavior within- and between individuals. The resulting ICCs indicated that a significant amount, 47% to 57%, of the total variability in parental interactive behavior could be attributed to individual differences. In a second step, unconditional growth models (Model B) were used to assess the individual variability in outcome-trajectories across time. Time was coded categorically, with the preintervention baseline measurement (T0) as reference category. Comparisons between Models A and B showed that adding time to the null models of parental interactive behavior improved model fit in both mothers and fathers, indicating the

Table 2
Comparisons of Multilevel Models for Maternal and Paternal Sensitivity, Intrusiveness and Withdrawal

			Sensitivity				Intrusiveness				Withdrawal			
Parent		Model	AIC	−2LL	*df*	χ^2	AIC	−2LL	*df*	χ^2	AIC	−2LL	*df*	χ^2
Mothers	A	Empty model	1602.43	1596.43	—	—	1493.79	1487.79	—	—	1595.38	1589.38	—	—
	B	Empty time model	1550.34	1522.34	11	74.09*	1444.34	1416.34	11	71.46*	1504.30	1476.30	11	113.08*
	C	+ Covariates	1500.25	1466.25	3	56.09*	1390.02	1356.02	3	60.32*	1455.99	1421.99	3	54.30*
	D	+ Time × Intervention	1495.70	1452.70	4	13.55*	1395.45	1353.45	4	2.56	1451.70	1409.70	4	12.29*
	E	+ Trauma × Intervention	1418.99	1372.99	2	79.71*	1332.09	1286.09	2	67.37*	1383.43	1337.43	2	72.27*
Fathers	A	Empty model	1357.26	1351.26	—	—	1299.85	1293.85	—	—	1458.72	1452.72	—	—
	B	Empty time model	1342.32	1314.32	11	36.94*	1226.19	1198.19	11	95.66*	1431.82	1403.82	11	48.90*
	C	+ Covariates	1256.84	1222.84	3	91.48*	1155.49	1121.49	3	76.71*	1329.52	1295.52	3	108.30*
	D	+ Time × Intervention	1252.21	1210.21	4	12.63*	1159.81	1117.81	4	3.68	1324.59	1282.59	4	12.93*

* $p < .05$.

relevance of individual differences in outcome-trajectories. In a third step, the control variables, the infants gestational age at birth, parental educational level, and parity were added as covariates. The resulting conditional growth curve models (Model C) provided a better fit to the data for all composite scores of maternal and paternal interactive behavior. In the fourth step, the models were expanded to test the intervention effect on parental sensitivity, intrusiveness, and withdrawal over time (Model D). This final Model D was used to investigate the impact of the VIG intervention. The estimates of fixed effects for the intervention models of maternal and paternal sensitivity, intrusiveness, and withdrawal are provided in Table 3. In Figure 2, the adjusted means of maternal and paternal interactive behavior are displayed over time for the intervention group and control group. Below, we outline the main differences in these trajectories across time for each of the three outcome variables. Parental intrusiveness was observed less frequently and values were positively skewed (mothers: skewness = 1.76, kurtosis = 3.37; fathers: skewness = 1.88, kurtosis = 3.75), in contrast to parental sensitivity (mothers: skewness = −0.33, kurtosis = 0.24; fathers: skewness = −0.33, kurtosis = 0.14) and withdrawal (mothers: skewness = 1.13, kurtosis = 0.68; fathers: skewness = 0.80, kurtosis = −0.09). However, because similar conclusions were reached when we took the natural log of the data, and the statistics proved to be robust to nonnormality, we chose to report the untransformed values instead of the logarithmically transformed values to facilitate interpretation for clinical applicability of the results.

Parental sensitivity. The intervention Model D was significantly better than Model C in which only the covariates were included. Parents in the intervention group showed more sensitive interactive behavior at mid- and postintervention measurements (i.e., T1 × intervention (after two VIG reviews) and T2 × Intervention, respectively), as compared with parents in the control group (mothers' T1 × Intervention interaction: $\beta = 0.42 \pm 0.14$, $p = .004$, $d = 0.24$; fathers' T1 × Intervention interaction: $\beta = 0.40 \pm 0.19$, $p = .04$, $d = 0.58$; mothers' T2 × Intervention: $\beta = 0.59 \pm 0.18$, $p = .001$, $d = 0.35$; fathers' T2 × Intervention: $\beta = 0.41 \pm 0.20$, $p = .04$, $d = 0.54$). However, at 6 months follow-up, no differences between treatment groups were observed in either mothers' or fathers' sensitive behavior (i.e., T3 × Intervention).

Parental intrusiveness. The intervention Model D did not improve the covariate Model C in both parents, indicating that parental intrusive behavior was not affected by the VIG intervention.

Parental withdrawal. The intervention Model D was significantly better than Model C, in which only the covariates were included. Mothers in the intervention group showed less withdrawn interactive behavior at mid-intervention and 3 weeks postintervention measurements, as compared with mothers in the control group (T1 × Intervention: $\beta = -0.41 \pm 0.16$, $p = .01$, $d = -0.31$; T2 × Intervention: $\beta = -0.59 \pm 0.20$, $p = .004$, $d = -0.44$). In fathers, the intervention effect on withdrawn behavior was marginally significant at mid-intervention measurement (T1 × Intervention: $\beta = -0.38 \pm 0.20$, $p = .055$, $d = -0.60$), and nonsignificant 3 weeks postintervention (i.e., T2 × intervention). At 6-months follow-up measurement, no differences between the treatment groups could be observed in mothers' or fathers' withdrawn behavior (i.e., T3 × Intervention).

In sum, VIG significantly changed parents' levels of sensitivity (i.e., more sensitive and positive behavior) and detachment (i.e., less withdrawn and detached behavior) during parent–infant interaction. The effect sizes were small to moderate for mothers, and moderate to large for fathers. The intervention positively altered parental interactional behavior after two review sessions, but the effect faded over time. VIG was not found to change explicit intrusiveness in parents (i.e., intrusive and negative behavior).

Parental Bonding

The effects of VIG on maternal and paternal bonding (mean differences and corresponding *p* values) are reported in Table 4. As there were minimal differences in unadjusted and adjusted estimates, only the covariate-adjusted means are presented. With regard to parental bonding, significant differences between the

Table 3
Estimates of Fixed Effects in the Final Multilevel Model for Maternal and Paternal Sensitivity, Intrusiveness, and Withdrawal

Parameter	Sensitivity[a]		Intrusiveness[a]		Withdrawal[a]	
	Estimate (*SE*)	*p* value	Estimate (*SE*)	*p* value	Estimate (*SE*)	*p* value
Mothers						
Intercept	4.49 (0.80)	<0.001	0.47 (0.70)	0.04	2.94 (0.81)	<0.001
T1[b]	0.30 (0.11)	0.01	0.00 (0.10)	0.97	−0.26 (0.12)	0.03
T2[b]	−0.16 (0.13)	0.21	0.33 (0.13)	0.01	0.03 (0.14)	0.84
T3[b]	0.26 (0.16)	0.10	0.34 (0.16)	0.03	−0.66 (0.15)	<0.001
Gestational age[c]	0.02 (0.02)	0.45	0.03 (0.02)	0.14	−0.02 (0.02)	0.50
Parity[c]	0.12 (0.14)	0.37	−0.20 (0.12)	0.09	−0.03 (0.14)	0.82
Educational level[c]	0.43 (0.10)	<0.001	−0.37 (0.09)	<0.001	−0.41 (0.10)	<0.001
Intervention[d]	−0.18 (0.18)	0.31	0.11 (0.16)	0.49	0.09 (0.21)	0.67
T1 × Intervention	0.42 (0.14)	0.004	−0.01 (0.14)	0.96	−0.41 (0.16)	0.01
T2 × Intervention	0.59 (0.18)	0.001	−0.16 (0.18)	0.38	−0.59 (0.20)	0.004
T3 × Intervention	0.29 (0.22)	0.19	0.11 (0.22)	0.63	−0.26 (0.21)	0.22
Fathers						
Intercept	3.33 (0.89)	<0.001	0.64 (0.69)	0.02	3.19 (0.92)	<0.001
T1[b]	0.18 (0.15)	0.21	0.12 (0.12)	0.32	−0.38 (0.15)	0.02
T2[b]	−0.15 (0.15)	0.31	0.67 (0.16)	<0.001	−0.13 (0.16)	0.43
T3[b]	−0.18 (0.17)	0.29	0.40 (0.15)	0.01	−0.35 (0.20)	0.08
Gestational age[c]	0.04 (0.02)	0.18	0.02 (0.02)	0.29	0.00 (0.03)	0.90
Parity[c]	−0.28 (0.14)	0.05	−0.13 (0.11)	0.23	0.34 (0.15)	0.02
Educational level[c]	0.42 (0.10)	<0.001	−0.09 (0.08)	0.25	−0.53 (0.10)	<0.001
Intervention[d]	0.21 (0.20)	0.30	0.10 (0.14)	0.48	−0.27 (0.24)	0.28
T1 × Intervention	0.40 (0.19)	0.04	−0.05 (0.16)	0.78	−0.38 (0.20)	0.055
T2 × Intervention	0.41 (0.20)	0.04	−0.32 (0.22)	0.13	−0.25 (0.21)	0.25
T3 × Intervention	0.12 (0.23)	0.60	−0.14 (0.20)	0.49	−0.10 (0.27)	0.70

Note. Outcome measurements at baseline (pre-intervention, T0), mid-intervention (after two video interaction guidance reviews, T1), 3 weeks (T2) and 6 months (T3) postintervention.
[a] Higher scores represent more of the indicated quality of parental behavior toward the infant (i.e., more sensitive, intrusive, or withdrawn behavior). [b] Time (T) was dummy coded, with the pre-intervention baseline measurement (T0) as reference category. [c] Higher scores indicate a higher gestational age at birth, higher parity births, and higher educational level. [d] The control group was coded as 0, the intervention group was coded as 1.

intervention and control groups were observed at postintervention measurements.

One day postintervention, both mothers and fathers in the intervention group reported significantly higher scores on enjoyment about and responsiveness to the infant (MBI-ER) as compared with the control group (mothers' mean difference at W1, 1.44; 95% CI, 0.42 to 2.46; $p = .01$; fathers' mean difference at W1, 2.10; 95% CI, 0.74 to 3.45; $p = .002$). No long-term differences between the treatment conditions were observed in mothers' MBI-ER scores (i.e., mean difference at M3), whereas in fathers, the effect of VIG on these outcomes was still present at M3 (mean difference at M3, 0.73; 95% CI, 0.02 to 1.43; $p = .04$). At M1, both mothers and fathers in the intervention group reported more affiliative behavior toward the infant (YIPTA-AB; mothers' mean difference at M1, 1.19; 95% CI, 0.18 to 2.20; $p = .02$; fathers' mean difference at M1, 1.89; 95% CI, 0.38 to 3.41; $p = .01$). In addition, fathers in the intervention group reported a higher level of checking on the infant (YIPTA-CC; mean difference at M1, 1.66; 95% CI, 0.36 to 2.97; $p = .01$), whereas no difference between treatment groups was observed in mothers' outcomes (i.e., mean difference at M1). With respect to attachment representations (YIPTA-AR), the differences between the groups did not reach significance in mothers (i.e., mean difference at M1) or in fathers (i.e., mean difference at M1). There were no effects of VIG on maternal reported bonding problems (PBQ sum; i.e., mean difference at M1 and M6), yet the outcomes on paternal bonding problems were significantly different between the intervention and control group. Fathers who received VIG reported fewer difficulties in parent–infant bonding at M1 (mean difference at M1, −2.10; 95% CI, −4.05 to −0.13; $p = .04$) as well as M6 postintervention (mean difference at M6, −2.08; 95% CI, −3.88 to −0.28; $p = .02$).

In sum, VIG had a significantly positive effect on several aspects of parent–infant bonding, in particular for fathers. While dissipation of the behavioral intervention effects occurred across time, the effects on paternal bonding were maintained until M6 follow-up.

Parental Stress and Psychological Wellbeing

The effects of VIG on maternal and paternal stress responses and psychological wellbeing are reported in Table 5. The comparative analyses revealed no statistically significant intervention effects. At W1 and M1, there were no differences between the treatment groups on maternal and paternal NICU-related stress responses (PSSNICU sum), infant related worries, and distress (MBI-W, YIPTA-FTW, YIPTA-DTW), or infant separation anxiety (MBI-SA). Regarding parental feelings of postnatal depression (EPDS), state anxiety (STAI-State), or state anger (STAXI2-

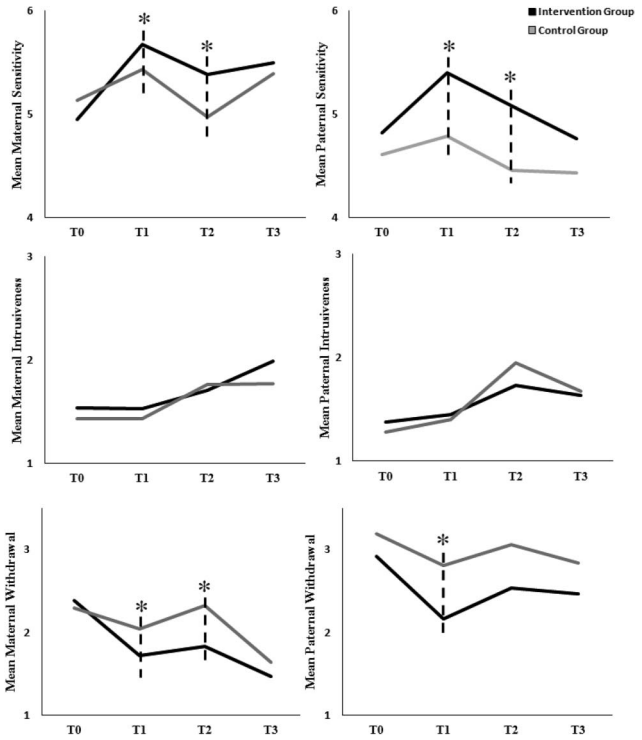

Figure 2. Adjusted means of maternal and paternal sensitivity, intrusiveness and withdrawal over time by treatment condition. Higher scores represent more of the indicated quality of parental behavior toward the infant (i.e., more sensitive, intrusive or withdrawn behavior). Outcome measurements at baseline (pre-intervention, T0), mid-intervention (after two VIG reviews, T1), 3 weeks (T2) and 6 months (T3) postintervention. Outcomes are adjusted for gestational age at birth, parity, educational level, and the main intervention effect. Mothers: Cohen's *d* sensitivity T1 = 0.24, T2 = 0.35; Cohen's *d* withdrawal T1 = −0.31, T2 = −0.44. Fathers: Cohen's *d* sensitivity T1 = 0.58, T2 = 0.54; Cohen's *d* withdrawal T1 = −0.60. * $p < .05$.

State); also no differences between treatment groups were detected.

In sum, VIG did not influence parents' level of stress and concerns related to infant's health status and the hospital/NICU environment. Neither did the intervention affect parents' psychological well-being or emotional state.

Maternal Trauma

Baseline comparisons revealed that 20.7% ($n = 31$) of the participating mothers experienced the preterm childbirth as a traumatic event ("trauma subgroup"). Of these women, 48.4% ($n = 15$) were in the intervention group and 51.6% ($n = 16$) in the control group.

To assess the intervention effect on interactional behavior for the trauma subgroup, the main effect of maternal trauma as well as the interaction term Intervention × Trauma were added to the ML models of maternal sensitivity, intrusiveness and withdrawal (+Trauma × Intervention, Model E), see Table 2 and Figure 3. Comparison between the intervention Model D and trauma Model E showed that adding the Intervention × Trauma interaction effect to the intervention model significantly improved model fit for maternal interactional behaviors. Parameter estimates revealed that mothers who had perceived the preterm birth as traumatic showed significantly less sensitive behavior ($\beta = -0.59 \pm 0.24$, $p = .02$) and more withdrawn interactional behavior ($\beta = 0.65 \pm 0.25$, $p = .01$) than mothers who did not perceive the preterm birth as traumatic. The Trauma × Intervention interaction effect revealed that the mothers with trauma receiving VIG demonstrated significantly more sensitive behavior ($\beta = 0.81 \pm 0.35$, $p = .02$) and less withdrawn behavior ($\beta = -0.87 \pm 0.36$, $p = .02$) as compared with trauma mothers in the control group. In the subset of trauma mothers, large effect sizes were found for the increases in sensitivity ($d = 0.80$ at T1, $d = 0.91$ at T2) and decreases in withdrawal ($d = -0.80$ at T1, $d = -1.04$ at T2). The intervention did not affect intrusive behavior in trauma mothers.

To assess the intervention effect on mother-infant bonding problems for the trauma subgroup, additional subgroup analyses were performed on the PBQ sum-score. Figure 4 shows the covariate-adjusted intervention effect on mothers' reported bonding problems, comparing the trauma subgroup with the nontrauma subgroup. Within the trauma subgroup, significant differences between the treatment groups were detected. Mothers in the trauma group who received VIG reported significantly less problems in bonding with the infant M1 postintervention (mean difference at M1, −4.22; 95% CI, −8.37 to −0.08; $p = .04$). In contrast, in the nontrauma group no such effects of VIG on maternal bonding (mean difference at M1, −0.06; 95% CI, −2.11 to 1.99; $p = .96$) could be detected.

In sum, maternal traumatic experience was found to be an important factor affecting mother–infant interaction and bonding. This subset of mothers who experienced the preterm birth as traumatic tended to benefit considerably from VIG in terms of behavior and bonding.

Discussion

The aim of this study was to evaluate a VIG intervention in parents experiencing preterm birth. VIG proved to be effective in enhancing positive maternal and paternal interactive behavior during daily dyadic parent–preterm infant interaction. Furthermore, VIG positively affected feelings of parental bonding. The intervention effects were particularly prominent in fathers, and in mothers who experienced the preterm birth as very traumatic. On the other hand, VIG failed to ameliorate the level of intrusive behavior in parents, or their emotional stress responses after preterm birth.

With regard to the effects on parental interactive behavior; mothers and fathers in the intervention group demonstrated more sensitive behavior (i.e., an increase in sensitivity and positive regard) and less withdrawn behavior (i.e., a decrease in detachment and flatness of affect), compared with parents in the control condition. These results are in line with previous studies (see Bakermans-Kranenburg, van IJzendoorn, & Juffer (2003) and Fukkink (2008)), which showed that the use of video-feedback is effective in promoting sensitive behavior in parents. It is important to note, however, that the behavioral effects were relatively short term, that is, until one month postpartum assessments. Nevertheless, the findings might be clinically relevant because the early postnatal period is known to be an essential developmental phase, a period in which the infant is very

Table 4
Adjusted Intervention Effects on Maternal and Paternal Bonding

		Intervention group	Control group	Mean difference		
Outcomes	T	Mean (*SE*)	Mean (*SE*)	Mean	(95% CI)	*p* value
Mothers						
MBI-ER	W1	29.40 (0.36)	27.96 (0.37)	1.44	(0.42 to 2.46)	0.01
MBI-ER	M3	30.13 (0.21)	29.75 (0.22)	0.38	(−0.22 to 0.98)	0.21
YIPTA-CC	M1	7.88 (0.49)	7.59 (0.50)	0.29	(−1.12 to 1.71)	0.68
YIPTA-AB	M1	14.29 (0.37)	13.10 (0.36)	1.19	(0.18 to 2.20)	0.02
YIPTA-AR	M1	11.23 (0.44)	10.67 (0.41)	0.56	(−0.61 to 1.75)	0.35
PBQ-Sum	M1	5.60 (0.54)	6.31 (0.54)	−0.71	(−2.23 to 0.80)	0.36
PBQ-Sum	M6	4.53 (0.44)	4.04 (0.44)	0.49	(−0.74 to 1.71)	0.44
Fathers						
MBI-ER	W1	28.05 (0.47)	25.95 (0.49)	2.10	(0.74 to 3.45)	0.002
MBI-ER	M3	29.69 (0.25)	28.96 (0.25)	0.73	(0.02 to 1.43)	0.04
YIPTA-CC	M1	7.20 (0.44)	5.54 (0.48)	1.66	(0.36 to 2.97)	0.01
YIPTA-AB	M1	12.76 (0.51)	10.87 (0.56)	1.89	(0.38 to 3.41)	0.01
YIPTA-AR	M1	9.38 (0.47)	8.20 (0.49)	1.18	(−0.18 to 2.54)	0.09
PBQ-Sum	M1	7.72 (0.69)	9.82 (0.71)	−2.10	(−4.05 to −0.13)	0.04
PBQ-Sum	M6	5.85 (0.63)	7.93 (0.66)	−2.08	(−3.88 to −0.28)	0.02

Note. Outcome measurements at 1 day (W1), 3 weeks (M1), 3 months (M3), and 6 months (M6) postintervention. Abbreviations questionnaires: My Baby and I Questionnaire (MBI): enjoyment/responsiveness = MBI-ER; Yale Inventory of Parental Thoughts and Actions (YIPTA): compulsive checking = YIPTA-CC, affiliative behavior = YIPTA-AB, attachment representations = YIPTA-AR; Postpartum Bonding Questionnaire (PBQ) = PBQ-Sum. Outcomes are adjusted for gestational age at birth, parity, and parental educational level.

susceptible to external influences such as parenting behaviors (e.g., Feldman, & Eidelman, 2003; Leckman et al., 2004; Ramchandani et al., 2013; Ravn et al., 2011). This applies also to prematurely born infants, both moderately and very preterm, who are exposed to their postnatal environment during a critical developmental period of rapid brain growth and neuronal maturation (Kinney, 2006). Since these infants undergo hospitalization and often invasive medical procedures at a time when they are extremely vulnerable to external conditions, the normal development of brain structures may easily be disrupted. The infant's (in)ability to manage the distress associated with the hospital environment and to regulate its behavior during medical procedures, becomes manifest during interaction with caregivers. The promotion of sensitive parental care and handling during the period of hospitalization is therefore of great importance for the preterm infant's well-being and development (VandenBerg, 2007).

However, while VIG appeared successful in improving parental sensitivity and involvement after preterm birth, the intervention failed to reduce explicit intrusive behaviors in parents (i.e., intrusiveness and negative regard). Our results on intrusiveness are difficult to compare with outcomes of previous video-feedback intervention studies, as earlier research primarily focused on the presence or absence of parental sensitivity, instead of actually coding negative behaviors. Insensitive behavior, however, is qualitatively different from purely negative or intrusive behavior. Parents, for example, may show insensitive behavior by a lack of warmth and responsivity in their interactions, but do not show intrusiveness either. We feel that assessment of these problematic caregiver behaviors is clinically useful, because parental sensitivity does not predict disorganized attachment in infants, while atypical, extremely insensitive, disturbed and maltreating parental behaviors are important precursors of infant attachment insecurity and disorganization (Benoit, Madigan, Lecce, Shea, & Goldberg, 2001; Van IJzendoorn, Schuengel, & Bakermans-Kranenburg, 1999).

A possible explanation for the failure to influence intrusive behavior could be that VIG aims to promote behavior change in parents primarily by emphasizing the positive aspects of the parent–infant interaction (Eliëns, 2010; Kennedy et al., 2011). Parents are specifically guided to reflect on video fragments of their own successful interactions, not on their negative responses to the infant's initiatives. It has been suggested that a focus on parental sensitivity would be more effective in decreasing parental disruptive behaviors, than a focus on the presenting problem itself (Benoit et al., 2001; Kennedy et al., 2011). Yet our findings suggest that an intervention with an exclusive focus on positive interactional behavior may not meet the specific needs of parents with serious parenting issues. Research among depressed mothers indicated that interventions may have differential effects on mothers with withdrawn versus intrusive interaction styles (Field, Hernandez-Reif, & Diego, 2006). When interaction patterns in parent–infant dyads are characterized by high levels of intrusiveness or negativity, VIG alone might not suffice to support parents. In multiproblem families, these interventions might be more effective when complemented with other types of support (Fukkink, 2008).

Our findings further show that VIG has a positive effect on several fundamental aspects in the process of bonding, such as enjoyment about and responsiveness to the infant. These feelings facilitate forming a strong bond in the first weeks after birth (Furman & O'Riordan, 2006). Obviously, the promotion of positive parental feelings and prevention of problems in parental bonding is deemed important after preterm childbirth, as a disrupted bonding process can negatively affect parents' interaction style and the parent–infant relationship. Especially in father-infant bonding positive effects were demonstrated, which maintained until 6-months follow-up. Fathers who received VIG reported more enjoyment, more affiliative behaviors, fewer problems in bonding, and also a higher degree of compulsive checking on their

Table 5
Adjusted Intervention Effects Maternal and Paternal Stress and Psychological Well-Being

		Intervention group	Control group	Mean difference		
Outcomes	T	Mean (*SE*)	Mean (*SE*)	Mean	(95% CI)	*p* value
Mothers						
PSSNICU-Sum	W1	71.95 (2.59)	72.97 (2.59)	−1.02	(−8.23 to 6.21)	0.78
MBI-W	W1	6.39 (0.34)	6.43 (0.34)	−0.04	(−0.97 to 0.90)	0.94
MBI-W	M3	4.61(0.22)	4.27 (0.22)	0.34	(−0.25 to 0.95)	0.26
MBI-SA	W1	13.57(0.34)	13.48 (0.33)	0.09	(−0.83 to 1.01)	0.84
MBI-SA	M3	12.09 (0.41)	11.92 (0.39)	0.17	(−0.95 to 1.29)	0.77
YIPTA-FTW	M1	17.38 (1.10)	17.04 (1.14)	0.34	(−2.73 to 3.43)	0.83
YIPTA-DTW	M1	6.45 (0.62)	6.46 (0.62)	−0.01	(−1.72 to 1.70)	0.99
STAXI2-State	M1	15.84 (0.45)	16.59 (0.44)	−0.75	(−1.99 to 0.48)	0.23
STAI-State	M1	32.00 (1.22)	31.80 (1.26)	0.20	(−3.12 to 3.53)	0.90
EPDS	M1	6.71 (0.60)	7.34 (0.62)	−0.63	(−2.30 to 1.04)	0.46
Fathers						
PSSNICU-Sum	W1	61.99 (2.28)	63.82 (2.34)	−1.83	(−8.31 to 4.64)	0.58
MBI-W	W1	6.38 (0.35)	6.30 (0.37)	0.08	(−0.93 to 1.08)	0.88
MBI-W	M3	4.12 (0.22)	4.18 (0.23)	−0.06	(−0.68 to 0.56)	0.84
MBI-SA	W1	11.88 (0.33)	11.22 (0.35)	0.66	(−0.31 to 1.62)	0.18
MBI-SA	M3	9.88 (0.37)	9.57 (0.34)	0.31	(−0.66 to 1.29)	0.52
YIPTA-FTW	M1	17.90 (1.05)	17.10 (1.07)	0.80	(−2.22 to 3.82)	0.60
YIPTA-DTW	M1	5.91 (0.53)	5.05 (0.55)	0.86	(−0.65 to 2.37)	0.26
STAXI2-State	M1	15.70 (0.45)	16.59 (0.44)	−0.89	(−1.87 to 0.09)	0.08
STAI-State	M1	31.41 (1.16)	32.21 (1.24)	−0.80	(−4.01 to 2.40)	0.62
EPDS	M1	4.01 (0.40)	3.54 (0.44)	0.47	(−0.72 to 1.66)	0.44

Note. Abbreviations questionnaires: My Baby and I Questionnaire (MBI): Worry = MBI-W, Separation anxiety = MBI-SA; Yale Inventory of Parental Thoughts and Actions (YIPTA): Frequency of thoughts and worries = YIPTA-FTW, Distress caused by thoughts and worries = YIPTA-DTW; Parental Stressor Scale: Neonatal Intensive Care Unit (PSS:NICU) = PSSNICU-Sum; State-Trait Anger Expression Inventory-2 (STAXI): state anger = STAXI2-State; State Trait Anxiety Inventory (STAI): state anxiety = STAI-State; Edinburgh Postnatal Depression Scale = EPDS. Outcomes are adjusted for gestational age at birth, parity and parental educational level. Outcome measurements at 1 day (W1), 3 weeks (M1) and 3 months (M3) post-intervention.

infant. During the first weeks after birth, compulsive checking by mothers is regarded as a behavioral component of 'primary maternal preoccupation' as described by Winnicott (1958). This preoccupation enables mothers to deeply focus on their infant and to completely attend to the infant's physical and emotional needs. Also in fathers, we consider such a state of heightened sensitivity to be important for the development of an affectionate relationship with the infant (Leckman et al., 2004).

There were no significant differences between the intervention and control group on self-reported intensity of emotions in parents, such as symptoms of depression, anxiety and anger. Moreover, the level of infant related distress and anxiety, as well as stress responses related to the hospital/NICU environment, were unaffected by the intervention. In other words, the negative feelings and concerns that typically accompany preterm birth do not seem to be reduced by the VIG intervention. Benzies, Magill-Evans, Hayden and Ballantyne (2013) distinguish the following three categories of key components of early intervention programs for parents of preterms: (a) provision of parental support (i.e., psychological counseling and social support), (b) parental education (i.e., information, demonstration and discussion, and active engagement with feedback from a professional), and (c) therapeutic child developmental support. Interventions which include the components of parental psychological support in combination with psycho-education are found to be most effective in diminishing psychological stress responses (i.e., distress, anxiety, and depressive symptoms) after preterm birth. Perhaps the fact that VIG does not provide psychological support, but merely psycho-education with a focus on successful moments of mutual parent–infant interaction may explain why the parents' stress levels were not decreased.

We also assessed intervention effects in mothers who qualified the preterm birth as traumatic, since maternal traumatic birth experiences may affect the quality of the mother-infant interaction (Müller-Nix et al., 2004). Our findings confirm that traumatic experiences are a major factor influencing the mother-infant relationship in terms of interactional behavior as well as bonding. Moreover, the results support our hypothesis that VIG is particularly beneficial for those mothers who perceived the preterm birth as a traumatic event, with positive effects on maternal interactive behavior as well as on reported bonding problems. In the nontrauma group, no such effects of VIG on bonding problems were detected. Bakermans-Kranenburg, van IJzendoorn, and Juffer (2003) already showed that interventions aimed at improving maternal sensitivity seem to be particularly effective in clinical and high-risk samples. Perhaps mothers at high risk of developing problems in the mother-infant relationship benefit most from VIG, as the potential for improvement is greater for mothers who start with a lower than average level of interactional behavior and bonding.

Before discussing the potential implications of our findings for practice, the strengths and limitations of the study merit discussion. The main strengths of our study are the pragmatic randomized design of the trial and the intention-to-treat analyses of the results. Since the effectiveness of VIG was evaluated in everyday hospital practice, results can directly inform clinical decision mak-

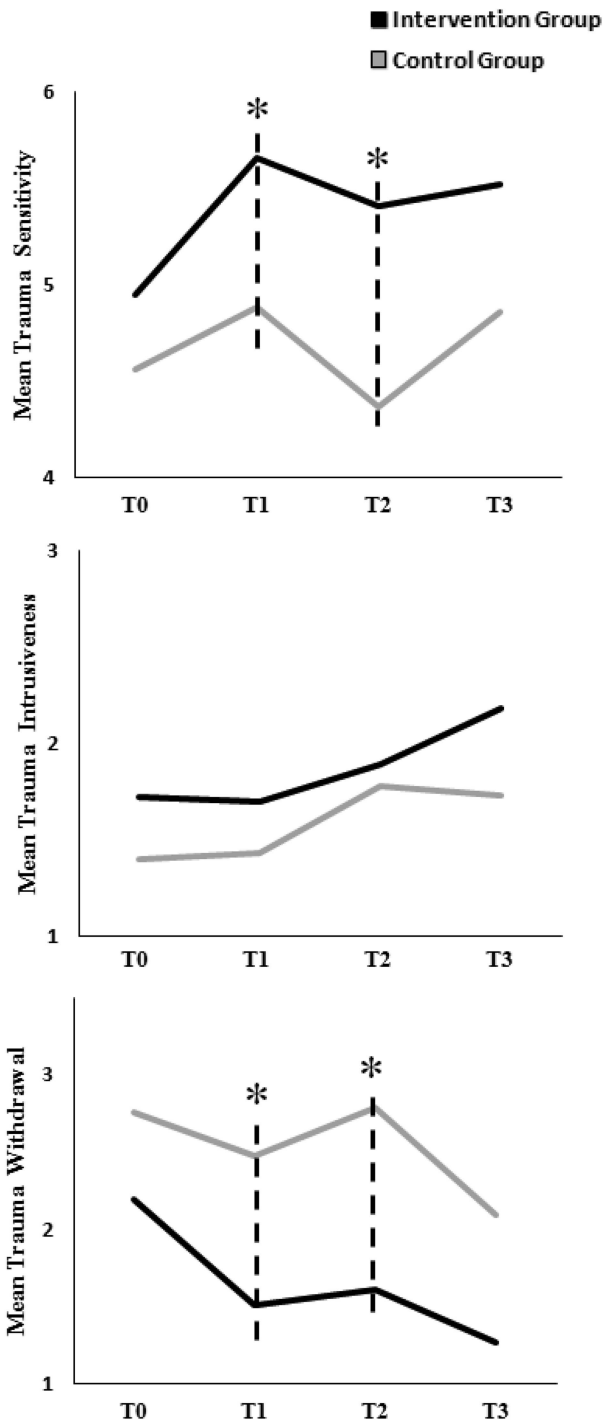

Figure 3. Adjusted means of maternal sensitivity, intrusiveness and withdrawal over time by treatment condition, for mothers with a traumatic preterm childbirth. Higher scores represent more of the indicated quality of parental behavior toward the infant (i.e., more sensitive, intrusive or withdrawn behavior). Cohen's *d* sensitivity T1 = 0.80, T2 = 0.91; Cohen's *d* withdrawal T1 = −0.80, T2 = −1.04. Outcome measurements at baseline (preintervention, T0), mid-intervention (after two VIG reviews, T1), 3 weeks (T2) and 6 months (T3) postintervention. Outcomes are adjusted for gestational age at birth, parity, educational level, and the main intervention effect. * $p < .05$.

ing. Furthermore, both mothers and fathers were included. Moreover, the effectiveness of the intervention was evaluated on a broad range of behavioral and psycho-social outcomes.

On the other hand, the study has also some limitations that must be considered. First, it is not clear which part of the intervention program actually accounts for the effects. The change generating component could be parents' self-observations via video recordings, the provided information on the infant's initiatives and responsiveness, or the positive feedback by the VIG nurses. To gain understanding about the precise mechanisms that generate behavior change in parents, future research should focus on units smaller than the intervention effects. Second, we neither can provide information about the optimal number of VIG review sessions. Although the study's intervention consisted of three sessions in the first postpartum week, VIG already positively altered parental interactional behavior after two review sessions. However, the behavioral intervention effects dissipated over time. Further research is needed on the exact rate of decay of intervention effects, the effects on infant development and behavior, as well as the long-term outcomes in parents. Perhaps booster sessions (in hospital or at home) can increase the long term effects. In addition, some methodological restrictions of the study must be noted. First, a disadvantage of the applied method of intention to treat is that it generally provides a more conservative estimate of the intervention effect compared with what would be expected with full compliance. In addition, increased levels of intervention adherence in a trial setting may challenge the generalizability of the results to clinical practice. Second, our results may suggest that the effects of VIG are stronger for fathers than for mothers, but a direct comparison between the outcomes of mothers and fathers was not conducted. Additional research on gender differences is necessary to further validate this notion. Third, the interrater agreement for the observational coding of parental behavior appears to be somewhat less than desirable. A final methodological limitation concerns the relatively small sample size of mothers who met the trauma criteria ($n = 31$). Further research into the generalizability of the findings on maternal trauma would be welcomed. This also

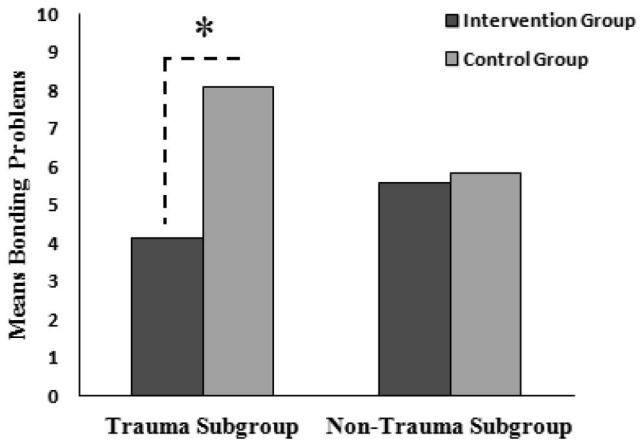

Figure 4. Adjusted intervention effect on reported bonding problems, for mothers with a traumatic and for mothers with a non-traumatic preterm childbirth. Outcome measurements at 3 weeks (M1) postintervention. Outcomes are adjusted for gestational age at birth, parity and maternal educational level. * $p < .05$.

holds for research on other subgroups of parents that might benefit of VIG; for instance fathers who experienced the preterm birth as traumatic, and mothers who experienced psychological problems (e.g., postnatal depression) or physical problems (e.g., pregnancy or delivery complications) after preterm birth.

The following implications for health-care policy may be formulated. As VIG, a short-term, nonintrusive, and relatively low-cost intervention, proved to be effective in enhancing the quality of interactive behavior and bonding in parents of preterm infants, implementation of the intervention in maternity wards and NICUs can be useful in supporting parents with a preterm infant. Because VIG showed significant effects in both mothers and fathers, it is advisable to include the mother–father–infant triad in the intervention when possible. Moreover, our findings may justify baseline screening on maternal trauma, as VIG was found to be particularly beneficial for the subset of mothers who experienced the preterm birth as traumatic. Since the intervention did not change intrusiveness in parents, identification of parent–infant dyads at risk for adverse interactive behavior is recommended. For these parents at risk of intrusive parenting, VIG might be more effective when integrated in a comprehensive support program that focuses on a wider range of problems.

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