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## Effectiveness of therapeutic behavioral interventions for parents of low birth weight premature infants: A review

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### Abstract

Premature birth has been associated with a number of adverse maternal psychological outcomes that include depression, anxiety, and trauma as well as adverse effects on maternal coping ability and parenting style. Infants and children who were premature are more likely to have poorer cognitive and developmental functioning and, thus, may be harder to parent. In response to these findings, there have been a number of educational and behavioral interventions developed that target maternal psychological functioning, parenting and aspects of the parent-infant relationship. Since the last comprehensive review of this topic in 2002, there have been a significant number of developments in the quality of the studies conducted and the theoretical models that address the experience of parents of premature infants. In the current review, eighteen new interventions were identified and grouped into four categories based on treatment length and the target of the intervention. Findings suggest a trend towards early, brief interventions that are theoretically based, specifically target parent trauma, and utilize cognitive behavioral techniques. Although it is difficult to generalize study findings, conclusions from the review suggest that targeted interventions may have positive effects on both maternal and infant outcomes.

### Keywords

neonatal intensive care; maternal distress; premature infants

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Rates of premature births (<37 weeks gestation) have increased by 31% from 1981 to 2005 (Hamilton, Martin, & Ventura, 2006; Institute of Medicine, 2006; Kramer et al., 2000; Raju, 2006). This increase, coupled with the rise in the survival rate of premature infants, has contributed to an increase in the total number of hospital days spent in neonatal intensive care units (NICUs) in addition to significant increased healthcare costs that persist past childhood and into adulthood (Petrou, 2003).

In addition to the economic impact of premature births, it is common for the parents, in particular mothers, of hospitalized premature infants to have complex and long term

psychological reactions that include feelings of guilt, sadness over the loss of the “perfect” child, depression, and symptoms of posttraumatic stress disorder (Hagan, Evans, & Pope, 2004; Kersting et al., 2004; Miles, 1989). Further, maternal depression and trauma may have a negative impact on future parenting style (Goodman & Gotlib, 1999; Miles, Funk, & Kasper, 1992; Ross & McLean, 2006). Premature infants who commonly exhibit behavioral and cognitive problems and who are also less developmentally resilient than full term infants may be particularly susceptible to suboptimal parenting interactions (Gray, Indurkha, & McCormick, 2004; Litt, Taylor, Klein, & Hack, 2005; Singer et al., 2003). Such concerns have prompted considerable interest in interventions that target both parental psychological outcomes and quality of parent-infant interactions.

Melnyk and colleagues (2002) published the only existing critical review of the effectiveness of interventions with parents of premature infants almost one decade ago. In this review, designed to inform clinical practice, the authors noted a number of deficiencies in the literature which included a lack of consistency in the length or intensity of treatment sessions, small sample sizes, the lack of a theoretical framework to inform the interventions, late commencement of intervention, and costliness (Melnyk, Feinstein, & Fairbanks, 2002). The review concluded with recommendations for future research (see Table 1).

Since Melnyk's 2002 review, there have been a number of new developments with respect to interventions for parents of preterm infants. These include greater recognition and focus on the issue of parental trauma and posttraumatic stress reactions as well as the development of a number of innovative and evidence-based interventions that target parenting and the parent-infant relationship. However, there has been no critical review of the effectiveness of these newer, more comprehensive interventions. Thus, this manuscript examines interventions published after the Melnyk et al. 2002 review and focuses specifically on the impact of these newer interventions on maternal (depression, anxiety, trauma, coping, parenting style) and infant (growth, developmental level) outcomes.

## Method

### Search Strategy

A literature search of the PsychINFO, Medline, PubMed, and Web of Science databases was conducted using the following terms: “preterm infant,” “premature infant,” “low-birth-weight infant,” “intervention,” “treatment,” “parent,” “mother” “stress” and “distress.” The search produced 91 abstracts for PsychINFO, 18 abstracts for Medline, and 357 abstracts for Web of Science. Each abstract was reviewed to insure that there were data on the intervention and not just a description, and that the article had been published in a peer reviewed journal. Only relevant articles with clear descriptions of the sample and intervention as well as outcome data were included. Following an examination of these references and any relevant studies that were cited in these articles we identified a total of eighteen interventions that were either not included in Melnyk and colleagues' (2002) review, or were included in their review but had updated data.

### Literature Review Structure

The eighteen interventions are described according to their intervention components, research methodology, and treatment outcomes (see Tables 2-5). Interventions were grouped into four categories based on treatment length and target of the intervention: (1) long-term interventions; (2) short-term treatments that specifically target parental coping and parent-infant interaction; (3) short-term interventions that specifically target symptoms of parental posttraumatic stress disorder (PTSD); and miscellaneous interventions that do not fit into any of these categories.

## Literature Review

### Long-Term Intervention Studies

Four interventions were reviewed that were considered to be long-term treatments for parents of preterm infants that varied in duration from one to three years (see Table 2). The first of these interventions, *Community Pathways*, was a comprehensive, support-based intervention differentiated by the fact that it was initiated immediately after the infant's birth. It provided services that included resource materials, informational services, and socio-emotional support (Freund, Boone, Barlow, & Lim, 2005) and continued for both preterm and full term infants at risk of developmental delay until age 3 years. Outcome data for this intervention consisted of structured interviews with ten parents and twelve healthcare providers (Freund et al., 2005). Qualitative data obtained suggested that the program helped mothers take better care of their infant, become more connected to their infant, make a smoother transition home, and overcome parental feelings of anxiety that often impair the ability to advocate for their infant and ask questions of medical personnel (Freund et al., 2005). However, the conclusions drawn from this intervention study were limited by its small sample size, the qualitative nature of the data, the lack of a control group. In addition, comparison with other studies is difficult since it included full-term infants with complex congenital abnormalities.

The other three interventions identified as long-term treatments were all implemented at discharge, but varied widely in terms of the nature of the intervention. The *Infant Health and Development Program* (IHDP) was included in Melnyk and colleagues' (2002) review but has since published new outcome data. IHDP is a comprehensive support- and education-based intervention that includes home visits, parent group meetings, and anticipatory guidance provided to parents of premature infants (McCarton et al., 1997). The intervention began at discharge and was offered until infants were three years of age. The treatment was studied in a multisite randomized controlled trial (RCT) that included 377 mother-infant dyads in the treatment condition. Recent research indicated that the intervention was associated with improvements in cognitive development, including reading and math, and higher rates of maternal employment that were sustained until age 18 years (Martin, Brooks-Gunn, Klebanov, Buka, & McCormick, 2008; McCormick et al., 2006). Overall, the research methodology for this comprehensive support and education-based intervention was strong and the effects of the intervention were enduring.

Gianni et al. (2006) conducted a RCT with 36 mothers of premature infants that specifically excluded infants with congenital or chromosomal abnormalities. This intervention began after discharge and continued until the infants were one year old. The aim of the intervention was: (1) to help mothers verbalize feelings of grief, guilt, and anxiety with the goal of preventing mothers from projecting these emotions onto their infants; and (2) to improve mothers' capacity to observe and interpret their infant's behaviors more accurately in order to promote infant social-cognitive skills. Although this early developmental mother-child intervention program resulted in improved neurodevelopmental outcomes, the authors did not report on measures of parental coping or distress. The generalizability of the findings with respect to the infant outcomes was also limited due to the small sample size.

The fourth intervention in this category, *VIBeS Plus*, was educational in nature and continued until the infant was approximately one year corrected age (Spittle et al., 2010). Spittle and colleagues (2010) provided parents with education as a means to improve postural control, behavioral regulation and mobility in their infants. The authors evaluated *VIBeS Plus* in a randomized clinical trial of 120 participants and found that it not only improved infant dysregulation and externalizing behaviors, but was also associated with reduced levels of parental depression and anxiety.

Overall, results of studies in this category of long-term interventions supported the finding of positive results with respect to both parent and infant outcomes. Of the three interventions that assessed parental outcomes, two resulted in a reduction in parental stress and one improved parental employment history. Of the three long-term interventions that measured infant outcomes, each resulted in improved cognitive and/or behavioral outcomes. However, it was somewhat difficult to generalize findings from these studies since they differed widely with respect to nature of support provided to parents. In addition, the inclusion criteria for the studies vary, with the study by Freund et al. (2005) including full-term infants with complex congenital disease. Another criticism of these studies, based on recommendations made by Melnyk et al. (2002) (see Table 1) is that the long-term nature of the interventions suggests the need for considerable resources for their implementation. As a result, interventions in this category may not be feasible in usual care settings.

### Short-Term Interventions to Improve Parental Coping and Parent-Infant Interaction

More recently there has been a trend towards the development of shorter-term interventions, which are less costly and more feasible for implementation in the NICU setting (see Table 3). One example is the *Mother-Infant Transaction Program* [*MITP*; (Rauh, Achenbach, Nurcombe, Howell, & Teti, 1988)], which was included in Melnyk and colleagues' 2002 review. The original educational treatment consisted of eleven sessions that continued until three months post discharge, but was shortened in a subsequent modification (Rauh et al., 1988). *MITP* aimed to improve the infant environment by teaching the parents ways to enhance developmental outcomes (Rauh et al., 1988). Educational sessions enhanced maternal adjustment by teaching infant cues, infant states, and appropriate sensitive responses. Additionally, nurses provided mothers with a logbook of infant changes, which encouraged infant redefinition (i.e. helping mothers to redefine their infants as being less fragile and having a less negative prognosis).

Two variations of *MITP* were recently evaluated in randomized clinical trials (Kaaresen et al., 2008; Milgrom et al., 2010; Newnham, Milgrom, & Skouteris, 2009). In addition to reduced treatment length, modifications included earlier timing (treatment completion prior to discharge rather than home visits post discharge), the opportunity to express feelings of grief and guilt, increased encouragement of active participation of parents, education about massage and Kangaroo Care [KC; (a practice of holding infants upright on one's chest and providing skin-to-skin contact)], and the use of an educational bath session (Kaaresen et al., 2008; Milgrom et al., 2010; Newnham et al., 2009). Parental outcomes for these interventions included reduced parenting stress, improved child-rearing attitude, improved parental responsiveness, and a more positive view of their infant (Kaaresen et al., 2008; Nordhov, Kaaresen, Ronning, Ulvund, & Dahl, 2010; Olafsen et al., 2008). Effects on the infants included increased length of interaction, fewer difficulties in regulatory behaviors, and improved cerebral white matter micro-structural development brain development (Milgrom et al., 2010; Newnham et al., 2009). Thus, it appears possible to obtain favorable infant and parental outcomes by using brief interventions that are feasible and cost-effective.

Three additional short-term treatments focused simultaneously on parent-infant interaction and parents' coping and emotional states. These include *Creating Opportunities for Parent Empowerment* [*COPE* (Melnyk et al., 2006)], *Cues and Care* (Zelkowitz et al., 2008, 2011) and *Promoting Mothers' Ability to Communicate* [*PMAC*; (Feeley et al., 2008)]. The *COPE* intervention provided parents with four sections of written and audio taped materials, which included: (1) information related to the appearance and behavior of premature infants; (2) journaling about the infant's special characteristics and milestones; (3) providing information about the parental role in the NICU and best ways to care for and promote the infant development; (4) activities to help parents identify infant cues; (5) information about

infant states, optimal times for interaction, the transition home, and ways to enhance the parent-infant relationship; and (f) information to help anticipate premature infant development and foster cognitive development in their infant (Melnyk et al., 2006). Results of a randomized clinical trial with 260 families revealed that COPE led to decreased symptoms of parental depression and anxiety, improved parental confidence in their parental role, increased positive parent-infant interactions, increased knowledge of infant behavior, and decreased length of hospital stay (Melnyk et al., 2006).

*Cues and Care* includes material that was adapted directly from *COPE*. This intervention has *not* been found to produce any statistically significant differences in any of the maternal outcome measures including maternal sensitivity, stress, anxiety, depression, and PTSD despite the fact that it contains material adapted directly from *COPE*. Explanations for this finding included the possibility that the control groups received increased therapeutic care and attention, there were relatively high numbers of participants lost to follow-up, and that the early timing of post-intervention assessment may not have allowed enough time for the effects of the intervention to be fully developed (Zelkowitz et al., 2011). Similar to *Cues and Care*, *PMAC* is brief, begins soon after birth, and includes CBT for anxiety and maternal sensitivity training (Feeley et al., 2008). However, the effectiveness of *PMAC* has not yet been established.

In sum, data from short-term interventions that attempted to address both parental stress as well as parent-infant interactions are mixed. Results from studies that used *COPE* and *MITP* were very positive while the efficacy of *Cues and Care* and *PMAC* has yet to be demonstrated.

### Interventions Specifically Targeting Parental PTSD

More recently, the trauma model has been used to conceptualize the psychological experience of parents who have an infant hospitalized in the NICU (Holditch-Davis, Bartlett, Blickman, & Miles, 2003; Peebles-Kleiger, 2000; Pierrehumbert, Nicole, Muller-Nix, Forcada-Guex, & Ansermet, 2003; Schulz, Resick, Huber, & Griffin, 2006). The prevalence of PTSD in mothers of preterm infants and the implications of maternal PTSD on the infant have been widely reported (Holditch-Davis et al., 2003; Kersting et al., 2004; Pierrehumbert et al., 2003; Schechter et al., 2005).

Two treatments intended to both reduce and prevent the development of trauma-related symptoms in new mothers of preterm infants have been evaluated (Bernard et al., 2011; Jotzo & Poets, 2005). Bernard and colleagues (2011) brief cognitive behavior therapy (CBT) intervention consisted of three forty-five minute sessions, delivered during a two-week period when the infant was still in the hospital. The intervention utilized a CBT model with the goal of reducing symptoms of depression, anxiety, trauma, and general distress (Bernard et al., 2011). Specific CBT-based skills such as cognitive restructuring and relaxation techniques were taught in addition to teaching about the common thoughts and feelings of NICU parents, preterm infant characteristics, and effective communication skills in the NICU setting. This intervention was evaluated in a pilot study with 56 mothers of preterm infants. Although the intervention did not significantly reduce trauma symptoms it did result in decreased depressive symptoms. The authors hypothesized that it was possible that their intervention was either too brief in nature or did not specifically target the mother's traumatic reactions.

Jotzo and Poets' (2005) treatment was more trauma-focused and began only a few days after birth. This intervention followed a primary prevention model consisting of an initial crisis intervention, meetings approximately two times per week, daily visits at critical times such as surgery, and the opportunity to ask for additional appointments. Treatment components

included: (1) a reconstruction of what happened immediately prior to and following the infant's birth; (2) introduction of relaxation and calming techniques; (3) education about trauma and stress reactions; (4) provision of support at times of emotional strife; (5) exploration of coping mechanisms, such as personal resources, social support, and practical problem solving (6) exploration of the parent's perception of their infant, and parent's potential for avoidance behaviors; (7) elicitation of the mother's detailed history regarding pregnancy and delivery in order to identify specific traumatic events (8) discussion of the parent-infant relationship and parental role; and (9) exploration of reactions to the NICU situation and encouragement of parents to express criticisms. Jotzo and Poets (2005) found that their intervention significantly reduced general trauma symptoms -- hyperarousal, intrusion, and avoidance -- in the twenty-five mothers who received the treatment.

Of the two treatments that target trauma symptoms, one reduced depression and anxiety but not trauma symptoms, and the other reduced trauma symptoms but it is unknown whether this reduced trauma had carry-over effects on the parent-infant relationship. Specifically, although Jotzo and Poets' intervention significantly reduced trauma symptoms, it is unknown whether it had an impact on other important areas such as parental coping, parental confidence, parent-infant interaction, and infant development. In addition, findings are limited by the small sample sizes in both of these studies.

### Miscellaneous Interventions

The final category of interventions in this review includes a miscellaneous group of interventions that did not fall clearly into a single class of interventions. *Kangaroo Care* (KC) is a specific parenting intervention that is widely utilized in NICU's promotes skin-to-skin contact between the mother and infant. A randomized controlled trial of KC with 146 mother-infant dyads showed that KC had statistically significant long-term benefits for both the parenting relationships as well as motor and perceptual-cognitive process of preterm infants (Feldman, Eidelman, Sirota, & Weller, 2002). Specifically, KC resulted in positive effects on maternal depression, perception of the infant as being less abnormal, increased maternal sensitivity, and improved ratings of the quality of the home environment (Feldman, Eidelman, Sirota, & Weller, 2002). One benefit of KC is that it is a relatively simple intervention that is frequently integrated into the treatments discussed in this review, and it is also commonly encouraged in the clinical NICU setting.

The Neonatal Individualized Developmental Care and Assessment Program (*NIDCAP*) is a developmentally focused intervention that aims to improve the infant's emotional and physical environment by observation and monitoring of the infant's stress responses and through modifications to the infant's environment (Als, 1999; Als et al., 2004; Als et al., 2003). Specifically, developmental care plans are written to address how to modify the caregiving environment in a positive way for the infant. Although a key aim of these care plans is to assist parents to become more sensitively involved in the care of their infant, the specifics about how parents are included, educated or supported are not well documented. Additionally, although findings indicated that *NIDCAP* led to improved physiological and cognitive development (Als, 1999; Als et al., 2003), decreased hospital stay length and hospital costs (Fleisher et al., 1995), and enhanced mother-child interaction (Kleberg, Westrup, & Stjernqvist, 2000), the effects of this approach on reducing parental stress have not been consistent (Als et al., 2003; Olafsen et al., 2008; van der Pal et al., 2008).

Similar to many treatments that were included in Melnyk's review, several recent interventions included teaching parents about infant cues and states, and how to provide appropriate sensitive responses (Brisch, Bechinger, Betzler, & Heinemann, 2003; Browne & Talmi, 2005; Meyer et al., 1994; Meyer, Lester, Boukydis, & Bigsby, 1998; White-Traut & Norr, 2009). One advantage of these interventions, compared with the majority of those

included in Melnyk and colleagues' 2002 review, was the delineation of a theoretical model that underpins each intervention. For example Brisch and colleagues' (2003) intervention, which was based on the *attachment model*, provides several attachment-oriented sessions in addition to parent sensitivity training. The attachment-oriented sessions focused on dealing the parents' experience of attachment with their own parents in the hopes that this would help them to reflect on their own experience and allow them to bond with their infant more easily; whereas the sensitivity training specifically aimed to help parents recognize and understand infant cues in order to promote secure attachment. Results of the intervention were limited to a non-statistically significant trend towards secure attachment within the intervention group (Brisch et al., 2003).

White-Traut and Noor (2009) have adopted the *transactional model* (Sameroff, 1983, 1993) as a basis for their interventions. Although the results of White-Traut and Noor's (2009) intervention have not yet been published, features of the intervention included a developmentally targeted multisensory intervention (described as "remediation"), education about infant states and behavioral cues ("redefinition"), and teaching mothers how to modify their response to cues, techniques to soothe infant, and how create a calm home environment ("reeducation"). Browne and Talmi (2005) have described a family-based intervention that provides either education or demonstration of infant behavior which has been found to enhance mother-infant interaction, increase parental knowledge of infant behavior, and decrease parenting stress. Overall, although the use of a theoretical model to inform the intervention is a relative strength, the conclusions that can be drawn from these studies is limited due to the small sample sizes.

## Critique and Implications

Although there has been a significant body of new research on interventions with parents of premature infants since Melnyk and colleagues' 2002 review, progress with respect to their specific recommendations has been uneven at best. In the first place, inclusion and exclusion criteria for the eighteen studies vary widely, with some using birth weight as the principle inclusion criterion (varying from <1250g - <2500g) while others use gestational age (varying from <27 weeks to <37 weeks) although some studies include full term infants. In addition, studies vary with respect to the exclusion of infants with congenital abnormalities. Thus, it is difficult to generalize findings. In addition, outcomes assessed in the eighteen studies also vary widely, with some assessing parental outcomes, some assessing infant outcomes (including cognitive, behavioral and brain development, length of hospital stay), and others providing data on parent-infant interaction.

One of Melnyk and colleagues (2002) recommendations was for early intervention with parents of premature infants; this is based on the belief that once patterns of parent-infant interaction become established, change may become more difficult (Berlin, Brooks-Gunn, McCarton, & McCormick, 1998). In addition, mothers who are educated and involved early in their infants' care are generally more sensitive and responsive to their infants' cues and have improved relationships with their children over time (Minde, 2000). Our review suggests that all but two of the interventions cited above were designed to be implemented at or before discharge and most frequently in the NICU setting.

A second recommendation of Melnyk et al. (2002) was that treatments should assist parents in understanding premature infants' behavior in order to facilitate parent-infant interaction. The majority of the interventions do incorporate information on infant characteristics, behaviors, cues, how to interact with their infant sensitively, and/or how to be involved in their infant's care. Specifically, thirteen interventions include these components, three do not, and one is unclear.

A third recommendation by Melnyk et al. (2002) was that interventions should be simple enough that they can be implemented in regular clinical settings. There has also been a trend towards brief interventions that presumably are more feasible in the inpatient setting and require fewer resources for implementation. In fact, only four of the eighteen reviewed interventions were considered to be long-term in nature (two continued for one entire year and two for three years). In line with the recommendation of Melnyk et al. (2002), the majority of the interventions cited begin relatively early, are rather brief, and teach parents about infant behaviors, characteristics, cues, and sensitive interaction and involvement in their infants' care.

Melnyk and colleagues' (2002) review also recommended that parents be assessed early for symptoms of anxiety and depression, so that they can receive intervention before these symptoms impact the parent-infant relationship. None of the eighteen articles discuss whether or not this occurs as part of common practice in parents of low birth weight infants, so whether or not this recommendation has been followed is unknown. However, although many of the eighteen interventions use symptoms of depression and anxiety as outcome measures, none of them use these measures to discriminate which parents receive the intervention and which do not. Thus, it appears as though this recommendation may have been largely neglected.

Similarly, Melnyk and colleagues' (2002) recommended that parental beliefs be assessed to identify those parents who are likely to benefit most from behavioral/informational programs. Whether or not this practice occurs regularly in parents of low birth weight infants is also not addressed in this collection of literature, so the degree to which this recommendation is followed is unknown. Although several treatment studies use measures of parental beliefs as outcome measures, none of them use this information to include or exclude certain parents from receiving the intervention. Thus, it appears as though the recommendation of Melnyk and colleagues (2002) to assess parental beliefs in order to identify parents who are most likely to benefit from intervention may also have been largely ignored.

Another major critique of the early literature has been that single site recruitment and small sample sizes limited the generalizability of the findings. Our review suggests that there has been progress with respect to both of these issues. Six out of the eighteen reviewed interventions were multisite trials, compared to a decade ago when only one out of eleven interventions met this criteria. Similarly, prior to Melnyk and colleagues' 2002 review, over half of the interventions reported data on less than fifty participants. In the eighteen studies in our review, five included fifty or less participants, six comprised fifty-one to one hundred participants, and seven included one hundred and one participants to two hundred and fifty two participants.

One particularly encouraging innovation in the research since 2002 is a trend towards the development of interventions that have a strong underlying theoretical orientation – the transactional, attachment, and trauma models – that helps guide their implementation. Broadly, interventions tend to focus either on parental stress and coping or promoting the parental role by improving parents' ability to understand, interact with, and care for their preterm infants, or combinations of these approaches (Ularntinon et al., 2010). These two approaches have the unified belief that improved parenting will enhance infant development, although they arrive at this deduction through different pathways. What is missing, in our opinion, from the current body of research are theoretically based interventions that target both parental stress and coping as well as parental competence and sensitivity with respect to premature and medically fragile infants. For example, increased awareness of parental trauma in parents of low birth weight infants has led to interest in interventions that target



parental trauma symptoms (Bernard et al., 2011; Jotzo & Poets, 2005). Such interventions are important since PTSD may have long term effects on maternal well-being that may last years after their child's birth (Breslau, Davis, Peterson, & Schultz, 1997; Kazak et al., 2004). Further, maternal trauma may negatively affect parenting style (Goodman & Gotlib, 1999; Ross & McLean, 2006). Symptoms of anxiety and trauma, for example, are thought to increase the risk of *vulnerable child syndrome* in parents of premature infants, who continue to view their children as vulnerable even after they are no longer at increased medical risk (Wightman et al., 2007). As a result, these parents are significantly more likely to adopt parenting styles that are intrusive, rigid and, later, overprotective and which may have adverse effects on both behavioral and developmental outcomes (Allen et al., 2004; Singer et al., 2003; Wightman et al., 2007). However, with the exception of work by Melnyk et al. (2006), there have been no interventions that specifically educate parents about the vulnerable child syndrome. In addition, there are no interventions that specifically address parental trauma but also focus on enhancing maternal-infant interaction and avoiding the parenting patterns that may be associated with an overprotective parenting style.

We conclude this review with our own recommendations that build on those of Melnyk's 2002 review: (1) interventions should be theoretically based and informed by developmental theory and models of parental adjustment and coping, including the trauma model; (2) interventions should systematically address parental stress and target symptoms of parental depression and anxiety; (3) interventions should incorporate early education about issues relevant to the parenting of premature infants, including awareness of and sensitivity to infant cues; (4) interventions should be tested in adequately powered randomized controlled studies to facilitate assessment of treatment efficacy; (5) interventions should be cost effective, and feasible in usual care settings; (6) interventions should be tiered in terms of their intensity and duration with more intensive interventions reserved for higher risk families; (7) longer term parent and infant outcomes should be assessed to help determine treatment efficacy; (8) interventions should incorporate fathers who generally have not been included in prior studies. It is notable that in the eighteen studies included in this review, only three made reference to the inclusion of fathers.

We conclude with the comment that much has been learned in the last decade with respect to interventions with parents of low birth weight and at risk infants. There is reason for optimism based on data from existing studies that have shown positive effects on both maternal symptoms as well as infant outcomes. However, further research is needed before firm conclusions can be drawn regarding the necessary components and format of interventions that will best suit the needs of the parents of low birth weight premature infants.

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**Table 1****Recommendations for Informational and Behavioral Interventions for Parents of Low Birth Weight Premature Infants**

1. Health care providers should provide parents with information regarding premature infant characteristics and how to become involved with their infant's care early in their child's care.
2. Parenting interventions should begin early with the goal of helping parents establish a pattern of positive parent-infant interaction.
3. Symptoms of parental anxiety and depression should be assessed and targeted before they impact the parent-infant relationship.
4. Parental beliefs should be assessed to identify those parents who are likely to benefit most from behavioral/informational programs.
5. Interventions should be feasible, timely, and cost-effective if they are to be implemented as part of routine clinical care.

Source: Melnyk, B. M., Feinstein, N. F., & Fairbanks, E. (2002). Effectiveness of informational/behavioral interventions with parents of low birth weight (LBW) premature infants: An evidence base to guide clinical practice. *Pediatric Nursing*, 28(5), 511-516.

**Table 2**  
Long-term Therapeutic and Behavioral Interventions for Parents of Low Birth Weight Infants

Author	Name	Population	Intervention	Design	Outcomes	Results
Freund et al. (2005)	Community Pathways	1. Both full and preterm infants at risk of developmental delays (i.e. born earlier than 29 weeks gestational age, have complex congenital issues, or complex congenital heart disease). 2. 25 care providers and 20 parents were contacted; 12 providers and 10 parents were interviewed. 3. Single site study.	Intervention was an individualized system of various supports for families post-discharge until age 3 years, including resource-material support, informational-services support, and socio-emotional support.	Qualitative data from post-intervention open-ended structured interviews.	Open-ended, structured interviews were focused on the intervention's effectiveness. Coding categories included resource-material support, informational-services support, socio-emotional support, program support for the healthcare team, needed improvements, and transition planning supports.	Parents reported that the support program helped them take care of their baby better, become more connected to their infant, make a smoother transition home, and overcome their feelings of anxiety that often impaired their ability to advocate for their infant and ask the medical staff questions.
Martin et al. (2008) McCarton et al. (1997) McCormick et al. (2006)	Infant Health and Development Program (IHDP)	Original study: 1. Birth weight <2500 grams. 2. Gestational age <37 weeks 3. No neurological impairments or severe medical illnesses. 4. Of 1302 eligible infants, 985 were included in the analysis. 5. 377 infants received treatment and 608 were in control group. 6. Multisite study. <u>Martin's Follow-up Study:</u> Mothers of infants who had participated in all previous waves, totaling 484, were included in the 15 year post intervention study. <u>McCormick's Follow-up Study:</u> 636 youth, 15 years post intervention.	Intervention duration was discharge through three years and included: (1) home-visits providing information to foster development, alter parental expectations, and provide support; (2) monthly parent group meetings; and (3) intensive educational and behavioral interventions from age one to three at a child development center.	Longitudinal follow-up of experimental study. Infants stratified by weight and site. Control group received standard care plus follow-up.	Martin's Study: 1. Full-time employment status 2. Five items from the Mental Health Scale of the Medical Outcomes Study Short Form General Health Survey 3. HOME Inventory 1. Woodcock-Johnson Tests of Achievement 2. Behavior Problem Index 3. Youth Risk Behavior Surveillance System 4. Peabody Picture Vocabulary Test 5. Weschler full-scale IQ measure. McCormick's Study: 1. Higher reading achievement scores for the lower birth weight control group ( $P = 0.08$ ). 2. Higher PPVT-III ( $p = 0.01$ ) and math ( $p = 0.01$ ) and reading ( $p = 0.07$ ) achievement scores for the higher birth weight treatment group when adjusted for attrition. 3. Fewer risky behaviors for the higher birth weight treatment group when not adjusted for attrition ( $p = 0.05$ ). 4. No statistically significant differences on Total Behavior Problem Index or Physical Health Scale.	Martin's Study: 1. Higher employment ( $p < 0.05$ ). 2. No significant differences for maternal mental health or home environment. McCormick's Study: 1. Higher reading achievement scores for the lower birth weight control group ( $P = 0.08$ ). 2. Higher PPVT-III ( $p = 0.01$ ) and math ( $p = 0.01$ ) and reading ( $p = 0.07$ ) achievement scores for the higher birth weight treatment group when adjusted for attrition. 3. Fewer risky behaviors for the higher birth weight treatment group when not adjusted for attrition ( $p = 0.05$ ). 4. No statistically significant differences on Total Behavior Problem Index or Physical Health Scale.
Gianni et al. (2006)	Early Developmental Mother-Child Intervention Program: Pilot Study	1. 18 infants in control group, 18 infants in intervention group. 2. Birth weight <1250grams and singletons. 3. Exclusion criteria: congenital diseases or chromosomal abnormalities.	Mothers and infants attended 1.5 hour group meeting two times a month, from the infant's corrected age of 3 months to one year. Intervention aimed to help the mother recognize and	RCT. Participants matched for birth weight and gestational age.	Griffiths Mental Development Scale and related subscales used to measure neurodevelopment at three years chronological age.	Infant outcomes: 1. Higher personal-social subscale scores ( $p = 0.02$ ) 2. Increased hand-eye coordination ( $p = 0.041$ ) 3. Higher practical reasoning ( $p = 0.01$ )

Author	Name	Population	Intervention	Design	Outcomes	Results
Spittle et al. (2010)	Victorian Infant Brain Studies (ViBeS Plus)	<p>4. Of the 61 infants born during the study, 25 were not eligible and all remaining were analyzed.</p> <p>5. Single site study.</p> <p>1. Infants &lt;30 weeks gestational age without extensive congenital abnormalities.</p> <p>2. 343 assessed for eligibility, 120 recruited, and 115 analyzed.</p> <p>3. 61 infants in treatment group, 59 in control group.</p> <p>4. Most infants recruited from one site, 6 recruited elsewhere.</p>	<p>Nine home visits provided by physiotherapist and psychologist when infant is 2 weeks to 11 months corrected age. Sessions focused on improving postural control, behavioral regulation and mobility by educating parents on appropriate ways to position, carry and play with their infant.</p>	<p>RCT.</p> <p>Control group receives standard follow-up care, consisting of visit with Pediatrician and Maternal and Child Health Nurse.</p>	<p>1. Infant-Toddler Social and Emotional Assessment at two years corrected age.</p> <p>2. Hospital and Depression Scale</p>	<p>Infant outcomes:</p> <p>1. Less dysregulation (<math>p &lt; 0.001</math>).</p> <p>2. Decreased externalizing behaviors (<math>p = 0.05</math>).</p> <p>Parent outcomes:</p> <p>1. Decreased depression (<math>p &lt; 0.001</math>).</p> <p>2. Decreased anxiety (<math>p = 0.003</math>).</p>



**Table 3**  
Short-term Interventions to Improve Parental Coping and Parent-Infant Interaction

Author	Name	Population	Intervention	Design	Outcomes	Results
Rauh et al. (1988)	Mother-Infant Transaction Program (MITP)	1. Infants < 2,250 grams and < 37 weeks gestational age with no severe neurological defects or congenital anomalies, and no single mothers. 3. 86 mothers eligible and 78 agreed to participate. 4. 38 dyads assigned to experimental group and 40 dyads assigned to control group. 5. Comparison group included 41 mothers from the well baby nursery.	1. 11 educational sessions starting one week prior to discharge and lasting until 3 months post discharge. 2. Fathers included when available. 3. Instruction about infant cues, infant states and sensitive responses. 4. Log book to promote infant redefinition of infants as being less fragile.	RCT. Included intervention group, low birth weight infant control group, and normal birth weight infant control group.	1. Quality of Mothering and Degree of Receptivity to the Program 2. Seashore Self-Confidence Rating Paired Comparison Questionnaire. 3. Taylor Manifest Anxiety Scale 4. Carey Infant Temperament Questionnaire 5. The Satisfaction Scale 6. Bayley Scales of Infant Development, Mental Development Indices 7. McCarthy General Cognitive Index (CGI)	Maternal Outcomes: 1. Better maternal self-confidence ( $p = 0.02$ ). 2. Perceived infant to be less difficult ( $p = 0.001$ ). 3. Role satisfaction and anxiety were not statistically significant. Infant Outcome: 1. Improved infant cognition two years post intervention on the McCarthy GCI ( $p < 0.01$ ). Quality of mothering and degree of receptivity to the program (measures of maternal response to intervention) associated with infant cognitive development.
Kaarsen et al. (2006) Kaarsen et al. (2008) Olafsen et al. (2008) Nordhov et al. (2010)	Modified Mother-Infant Transaction Program (Modified MITP)	1. Singleton or twin infants < 2000g, stratified as < 28 and > 28 weeks gestation without congenital anomalies. 2. Of 203 infants assessed for eligibility, 146 were included, and then 11 withdrew. 3. At 12 month follow-up, 71 in the preterm intervention group, 67 in the premature control group, and 72 in term group. 4. Single site study.	MITP with the following modifications: 1. Initial session to allow parents to vent experiences/grief. 2. Effort to adopt more active participation from parents. 3. 8 sessions two weeks prior to discharge and four home visits.	RCT. Included preterm intervention, preterm control, and full term control groups. Preterm control group received standard care.	1. Infant Behavior Questionnaire 2. Parenting Stress Index 3. Perinatal variables from medical charts 4. Clinical Risk Index for Babies 5. Score for Neonatal Acute Physiology 6. Neurologic sequelae judged by a neonatologist. 7. Bayley Scales of Infant Development 8. Child Behavior Checklist/2-3. 9. Child Rearing Practices Report	1. Improved child-rearing attitude in mothers up to three years post birth ( $p = 0.001$ ). 2. Reduced parenting stress for both mothers and fathers of premature infants during the first two years after birth (Mother's total stress, $p = 0.002$ ; father's total stress, $p = 0.007$ ; mother's child domain stress, $p = 0.001$ ; father's child domain stress, $p = 0.002$ ). 3. Level of stress comparable to that of parents of term infants.
Newnham, et al. (2009)	Modified Mother-Infant Transaction Program (Modified MITP)	1. Gestational age < 37 weeks, no congenital abnormalities or major neurological damage, and not part of a triplet or higher multiple. 2. 73 of the 80 eligible mothers agreed to participate. 3. 35 intervention mothers and 33 control mothers. 4. Analysis included 63 mothers due to dropouts and missing data. 5. Single site study.	MITP with the following modifications: 1. Education about massage. 2. Education about practice of Kangaroo Care. 3. Educational bath session. 4. 7 sessions prior to discharge, one session one month post discharge and one session at 3 month follow up.	RCT. Control group mothers and infants were provided with standard care.	1. Edinburgh Postnatal Depression Scale 2. Birth/medical information 3. Neonatal Medical Index 4. Short Temperament Scale for Infants 5. Synchrony Scale 6. Parenting Stress Index 7. Ages and Stages Questionnaire	1. No significant difference in depression. 2. Mothers were more responsive to infants ( $p < 0.05$ ). 3. Infants were more attentive ( $p < 0.012$ ) and alert ( $p < 0.012$ ). 4. Increased mother-infant reciprocity ( $p < 0.012$ ) and mutual attention ( $p < 0.012$ ). 5. Infants viewed as more "approaching," and "easier" as they had less crying, sleeping, and colic difficulties ( $p < 0.012$ ).

Author	Name	Population	Intervention	Design	Outcomes	Results
Milgrom et al. (2010)	Early Sensitivity Training for Parents of Preterm Infants (PremieStart: Modified MITP)	1. Gestational age <30 weeks, no congenital abnormalities but inclusion of twins. 2. 81 mothers of preterm infants assessed for eligibility, 45 met inclusion criteria. 3. 23 mothers in control group and 23 received intervention. 4. Recruited from two sites.	MITP with the following modifications: 1. Education about massage. 2. Education about practice of Kangaroo Care. 3. Educational bath session. 4. 9 sessions prior to discharge with one session one month post discharge.	RCT comparing parallel intervention and control groups. Control mothers received standard care.	1. Magnetic resonance imaging to assess brain structure and development. 2. Perinatal medical outcomes. 3. Improved cerebral white matter micro-structural development. 4. Shorter hospital stays, less hours on oxygen, and less sepsis incidents (all $p$ 's > 0.1). 5. More periods of kangaroo care ( $p = 0.003$ ).	6. Less maternal stress related to infant ( $p < 0.012$ ).
Melnyk et al. (2006)	Creating Opportunities for Parental Empowerment (COPE)	1. 260 families with premature infants in total were randomly assigned. 2. Of the 1278 families screened, 260 were eligible, willing to participate, and randomly assigned. 3. Participant data that was analyzed included 138 who received intervention and 109 controls. 4. Recruited from two sites.	Educational-behavioral intervention to improve parent-infant interactions and enhance infant development and behavior. 4 sessions of written and audiotaped materials, consisting of information and activities related to the appearance and behavior of premature infants and ways to parent.	RCT. Control group received information about hospital policies and services.	1. Infant LOS 2. State-Trait Anxiety Inventory 3. Parental Stressor Scale – Neonatal Intensive Care 4. Index of Parental Behavior in the NICU 5. Parental Belief Scale – NICU	Maternal Outcomes: 1. Decreased stress (State anxiety $p = 0.05$ ; stress related to NICU $p = 0.03$ ). 2. Increased confidence in the parental role ( $p = 0.018$ ). 3. Increased positive parent-infant interactions ( $p = 0.003$ ). 4. Increased knowledge of infant behavior ( $p = 0.001$ ). 5. Decreased depression ( $p = 0.02$ ) and anxiety ( $p = 0.05$ ). Infant Outcome: 1. Decreased length of hospital stay ( $p = 0.02$ ).
Zelkowitz et al. (2011)	Cues & Care	1. 121 mothers of very low birth weight (VLBW) infants recruited from two sites. 2. Singleton infants <1500 grams, who were not highly unstable, without a significant congenital anomaly, and not likely to be transferred in less than 4 weeks. 3. Of the 685 infants assessed for eligibility, 563 were excluded, and 98 were analyzed.	Six one-to-one sessions began shortly after birth and ended 2-4 weeks after discharge. Intervention aimed to help mothers recognize anxiety and distress, use strategies to relieve their distress, identify their infant's cues, and respond sensitively to their infant.	Two group RCT, stratified by site. Control group mothers match intervention mothers in terms of length and timing of contact.	1. State-trait Anxiety Inventory 2. Parental Stress Scale 3. Global Rating Scales of Mother-Infant Interaction 4. Edinburgh Postnatal Depression Scale Revised 5. Nursery Neurobiological Score	No differences between groups: 1. Degree of sensitivity in interaction ( $p = 0.99$ ) 2. Stress related to infant behavior and appearance ( $p = 0.14$ ) 3. Stress related to parental role restriction ( $p = 0.76$ ) 4. Anxiety ( $p = 0.28$ ) 5. Depression ( $p = 0.22$ ) 6. Post-traumatic stress ( $p = 0.54$ )
Feeley et al. (2008)	Promoting Mothers' Ability to Communicate (PMAAC)	1. 33 mothers of infants who were <1500 grams at birth without congenital abnormalities. 2. Single site study.	The one-to-one, six-session intervention focused on teaching sensitivity and reducing anxiety. Intervention utilized video feedback as a means for teaching. Treatment began one-month post birth with last session after discharge.	Pilot study with a pretest-posttest design with a single group.	1. Feasibility for: -enrolling and retaining mothers in intervention -data collection -observing mother's interventions with the infants at enrollment -delivering intervention as intended. 2. Acceptability of intervention as rated by mothers.	1. Enrollment was feasible, although 39% withdrew. 2. Implementation was feasible, as 80% of mothers who received the intervention participated in all six sessions. 3. Content and format was acceptable.

**Table 4**

**Interventions Specifically Targeting Parental Posttraumatic Stress Disorder**

Author	Name	Population	Intervention	Design	Outcomes	Results
Bernard et al. (2011)	Brief Cognitive-Behavioral Intervention for Maternal Depression and Trauma in the Neonatal Intensive Care Unit: A Pilot Study	1.56 mothers of infants >1,000 grams, <37 weeks gestational age, in the NICU, and expected to survive agreed to participate. 2.305 mothers eligible, but 196 not recruited due to hospital transfer. 3.7 mothers dropped out of intervention group, leaving equal numbered groups. 4.Single site study	Three-session CBT-based intervention aimed to reduce general anxiety, depression, and PTSD in NICU parents. Intervention consisted of three sessions of individual therapy that were 45-55 minutes long and focused on different skills, such as relaxation techniques, cognitive restructuring, and communicating effectively with NICU staff.	RCT. Control group received standard care, which included contact with physicians, nurses, social workers, and chaplaincy when requested.	1.Davidson Trauma Scale 2.Stanford Acute Stress Reaction Questionnaire 3.Beck Depression Inventory, Second Edition.	1.Reduced level of depression symptoms ( $p = .06$ ). 2.Trend towards lower levels of trauma symptoms ( $p = 0.23$ ) 3.86% of mothers found the intervention to be beneficial.
Jotzo & Poets (2005)	Trauma preventative psychological intervention.	1.Infants <37 weeks, with no congenital anomalies, and hospital stay expected to be at least >14 days. 2.217 mothers screened, 102 eligible. 58 included in study, 50 included in analysis. 3.Single site study.	Trauma focused treatment incorporated early crisis intervention and extra support at times that were critical. Treatment included a reconstruction of what happened immediately prior to and following birth, introduction of relaxation and calming techniques, normalization of stress and trauma reactions, and exploration of coping strategies.	Sequential control group design. Control group mothers were able to ask for counseling by a minister in the hospital.	1.Impact of Event Scale 2.Peritraumatic Dissociative Experience Questionnaire. 4.Medical information 5.Personal and family information.	Reduced symptoms: 1.Overall trauma ( $p = 0.013$ ) 2.Intrusion ( $p = 0.055$ ) 3.Avoidance ( $p = 0.023$ ) 4.Hyperarousal ( $p = 0.019$ ).

Table 5

Miscellaneous Interventions for Parents of Low Birth Weight Infants

Author	Name	Population	Intervention	Design	Outcomes	Results
Feldman et al. (2002)	Kangaroo Care (KC)	1. 146 infants with a mean birth weight of 1270g and a mean gestational age of 30.65 weeks were eligible, and 14 declined. 2. 73 infants received treatment, while 73 infants were controls. 3. Recruited from two sites.	Kangaroo Care, or Skin-to-skin holding, was engaged in for one or more hours a day, for fourteen consecutive days.	RCT, in which the infants who received the intervention were matched with control infants who received standard care.	1. Mother–Newborn Coding System 2. Beck Depression Inventory 3. Neonate Parental Inventory 4. Home Observation for the Measurement of the Environment 5. Infant Characteristic 6. Clinical Risk Index for Babies 7. Bayley-II	1. During hospitalization, mothers interacted with their infant more positively ( $p < 0.001$ ) and had reduced depressive symptoms ( $p < 0.001$ ). 2. Six months post hospitalization, more positive interactions ( $p < 0.01$ ) and improved infant development ( $p < 0.05$ ).
Als et al. (2003)	Neonatal Individualized Developmental Care and Assessment Program (NIDCAP)	1. Inclusion criteria: Singleton infants < 28 weeks, < 1250g, receiving ventilation within first three hours following birth and lasting at least 24 of the first 48 hours, alive after 48 hours, no chromosomal or genetic anomalies and congenital infections, who have one English speaking family member. 2. 92 infants included from 234 who were eligible (47 control, 45 experimental). 3. Treatment provided at three different sites	Intervention was a model for nursing care. Weekly, direct observation of infant behavior in order to create weekly care plans aimed to individualize caregiving. Family-centered and aimed to help parents appropriately address their preterm infant's developmental need. Intervention was provided by nurses and medical staff and was intended to reduce infant stress.	RCT, in which control group infants received standard care.	Several measures were used to assess neurodevelopmental, medical, and family function.	<b>Infant outcomes:</b> 1. Earlier discharge 2. Less days on oxygen 3. Increased regulation of motor and autonomic systems 4. Better tone, orientation, posture, and movement 5. Improved neurobehavioral scores, brain structure, and behavior. <b>Parent outcomes:</b> 1. Reduced life stress 2. Enhanced confidence.
Brisch et al. (2003)	Early Preventative Attachment-oriented Psychotherapeutic Intervention Program	1. Of 206 eligible mothers of preterm infants < 1500 g and mean gestational age of 27 weeks, 87 agreed to participate. 2. 12.7% overall drop-out rate. 3. 36 control mothers and 32 intervention mothers in final analysis. 4. Three infants were not able to be classified into an attachment quality. 5. Fathers were included in all aspects of intervention.	Parent-centered and comprehensive intervention included five sessions of weekly supportive group therapy, five sessions of weekly attachment-oriented individual therapy, one home visit one week post discharge, and one full-day video-based training to promote sensitive interaction three months post discharge.	Prospective longitudinal study design using random assignment. Study included blinded coders.	1. Strange Situation Procedure 2. Neurological evaluation	1. Tendency for secure attachment in intervention group ( $p = 0.084$ ). 2. While the proportion of Secure versus Insecure infants in the two groups did not differ for non-neurologically compromised infants, for infants who did have neurological impairment, there were proportionally fewer Insecurely attached infants in the Treatment versus Control Group.

Author	Name	Population	Intervention	Design	Outcomes	Results
White-Traut & Noor (2009)	Hospital-Home Transition: Optimizing Prematures' Environment (H-HOPE)	1. 252 mother-preterm infant dyads, in which the infant is 29-34 weeks at birth and without any serious complications. 2. Participants recruited from two sites.	Intervention included remediation (a developmentally targeted multisensory intervention), redefinition (teaching behavioral states and pre-feeding, engagement and disengagement behavioral cues), and reeducation (teaching mothers to modify response to cues, techniques to soothe infant, and create a calm home environment). Intervention occurred from 32-34 weeks gestational age until 4 weeks corrected age.	Intervention currently being studied in a 5 year RCT.	Specific outcome measures to be used were not specified.	Results not yet available. Authors anticipate increased infant behavioral organization and improved mother's ability to recognize her infant's behavioral cues. These effects are hoped to lead to improvement in both mother-infant interaction and infant development and growth, in addition to reduced hospital costs.
Browne & Talmi (2005)	Family-Based Intervention	1. Mothers of premature infants <36 weeks gestation without congenital abnormalities. Birth weight 1509-1617 g. 2. Of 112 eligible mother-infant dyads, 99 consented, and 84 completed the study. 3. Single site study. 4. Short term single session intervention.	Group 1: guided observation of infant's behavioral response to environmental stimuli, examiner manipulation and social interaction. Group 2: educational materials about parenting preterm infants, ICU experience and coping with stress. Group 3: control group received 30-45 minute session on follow up care for preterm infants.	RCT with assignment to one of two intervention groups versus control group.	1. Knowledge of Preterm Infant Behavior Scale (KPIB). 2. Nursing Child Assessment Feeding Scale (NCAFS) to assess maternal behaviors during feedings. 2. Parenting Stress Index. 3. Severity of Illness score.	1. KPIB scores lower for control group ( $p < 0.001$ ) indicating less knowledge. 2. NCAFS scores higher for control group indicating lower relationship quality ( $p < .05$ ) 3. PSI scores marginally higher for control group ( $p = .056$ ) indicating higher maternal perception of stress.