


Psycho-emotional intervention with parents of very preterm babies during the first year: A single-arm pilot study

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Abstract

Studies of intervention programs that aim to improve the emotional state of parents of children admitted to the neonatal intensive care units (NICU) are scarce in Spain. The aims of this single-arm pilot study are to get to know the emotional profile of parents of high-risk preterm newborns, and to explore parents' patterns of emotional well-being before and after a psychological program called the Parental Empowerment Program, to increase parental readiness levels. The sample was made up of 100 parents (50 couples) who participated in the program. Measurements were taken of post-traumatic stress, depression, and resilience at 1 month and 12 months. Repeated measurements and dyadic data analyses were performed. One month after the birth of the baby and prior to the start of the program, mothers show more symptoms of stress and depression than fathers. After the intervention, both parents experienced improvements in their mood levels. The evidence obtained seems to show that high resilience levels and low post-traumatic stress symptoms are associated with reduced depression levels after implementing the program. However, the heterogeneity of the responses obtained, the observed associations between stress, resilience, and maternal depression, along with the reciprocal influence between maternal and paternal depression 1 year after the intervention, highlight the need for a more in-depth exploration of the interplay between risk and protective factors in this population.

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Despite the identified potential threats to validity, further work in this direction is recommended, including the implementation of clinical trials to demonstrate intervention efficacy. The adaptation of the parents' mutual emotional adjustment at each stage would allow them to participate more actively in the baby's care.

KEYWORDS

depression/emotional distress, intervention program, parents of very preterm babies, resilience, single-arm pilot study, stress

INTRODUCTION

When a baby is born preterm and admitted to the Neonatal Intensive Care Unit (NICU), it is a stressful event that interferes with the development of the parental role (Lasiuk et al., 2013; Roque et al., 2017). Prematurity increases the level of parental stress (Ong et al., 2019; Treyvaud et al., 2011), depressive symptoms (Shaw et al., 2013; Singer et al., 1999; Underwood et al., 2017), and post-traumatic stress (Pierrehumbert et al., 2003; Shaw et al., 2013). In addition, risk factors compete with protective factors associated with the birth of a child, although research focusing on the relationship between the two is scarce (Burnette et al., 2020; Schappin et al., 2013).

Consistent with Feldman's (2007) model of parental stress and development in preterm infants, Zelkowitz et al. (2009) note that parents experience very intense emotions after birth, which affect their ability to understand their infants' needs. In particular, mothers have higher levels of anxiety and develop fewer sensitive behaviors.

From the perspective of family resilience, focused on the potential of families to overcome new difficulties and challenges, it is noted that some conditions at birth, such as extreme prematurity, may require adjustments and compensation in certain parents (Walsh, 2016), while other families are strengthened by these same circumstances. The so-called "posttraumatic growth" (Tedeschi & Calhoun, 2004) is a concept that explains the response of many parents of a high-risk baby, such as an extremely preterm infant. However, there are few studies that examine family resilience in the specific field of neonatology (Caruso & Mikulic, 2010; Colville & Cream, 2009; Escartí et al., 2016); although in recent years, emphasis has been placed on how important the family is as a unit to deal with this experience (Harris et al., 2018; Nikodem, 2009).

Interventions that aim to deal with the loss of the parental role, reduce stress, and strengthen parent-baby interactions are necessary (Lasiuk et al., 2013). Programs that combine different techniques (infant massage, sensory stimulation between mother and child, triadic interactions, the kangaroo method, relaxation techniques, narrative expression techniques, etc.) can be effective in reducing parents' trait anxiety ($p=0.02$) when comparing change in intervention versus control group (Fotiou et al., 2016); or to improve mothers' mental health ($d=1.2$) and reduce mothers' depression ($d=0.67$) in preterm births (Horsch et al., 2016). In addition, information sessions on prematurity, breastfeeding, preparing for hospital discharge, and childcare at home, to name a few, reduce stress and parental depression, while increasing maternal sensitivity and promoting bonding (Castel et al., 2016; Fotiou et al., 2016; Melnyk et al., 2006; Puthussery et al., 2018; Welch & Myers, 2016). They even reduce the length of time the baby stays in the hospital after birth (Melnyk et al., 2006). In short, preventive intervention with the family is essential to minimize the risk factors and enhance the protection factors.

In research with family-oriented intervention programs, a clear relationship can be seen between the clinical situation related to preterm birth (gestational age, birth weight, time in the NICU, among others) and the mental health of parents (Cajiao-Nieto et al., 2021;

Çekin & Turan, 2018; Kim et al., 2020). One of the most important limitations is the difficulty in assessing the strength of the effect of the intervention on emotional aspects in the parents, mainly the fathers. Indeed, few studies include an assessment of the fathers (Noergaard et al., 2017; Schecter et al., 2020; Underwood et al., 2017), and even fewer studies include them in the therapeutic intervention (Candelori et al., 2015; Lanzarote-Fernández et al., 2012; Miles et al., 2007; Singer et al., 1999). Emerging evidence suggests that fathers experience high rates of psychological distress in the first months after very preterm birth (Pace et al., 2016; Treyvaud, 2014), which may be related to the baby's appearance and behavior (Cajiao-Nieto et al., 2021). In addition, severe postnatal depression symptoms in fathers were associated with perceived stress in pregnancy (Underwood et al., 2017), even when fathers, in the face of preterm labor, may hide their anxious and depressive symptoms to protect themselves from pain and to protect their partners (Candelori et al., 2015). It has also been observed mental health difficulties in the parents of premature babies continue for up to 2 years after birth (Baraldi et al., 2020; Spencer-Smith et al., 2012; Treyvaud et al., 2010). Therefore, identifying fathers at higher risk of emotional distress can be beneficial to the fathers in their new role and furthermore, to the mother, the mother-infant relationship, and the family as a whole (Thomson-Salo et al., 2017), along the lines proposed by Egeland (2019) on attachment-based intervention and prevention programs for at-risk young children and their families.

The literature informs us that premature delivery, early separation of the baby, and prolonged admission have a great emotional impact on parents, the most frequent being symptoms of depression, post-traumatic stress, and other symptoms of psychological distress (Friedman et al., 2013). Specifically, the mental health of mothers and fathers are found to influence each other (Cano-Giménez & Sánchez-Luna, 2015) and, although mothers have worse outcomes after the birth of the very preterm infant, they improve more than fathers after intervention (Vriend et al., 2021; Winter et al., 2018).

The emotional experiences of parents can influence each other and the attachment process. Numerous positive outcomes are linked to secure attachment (Egeland, 2019; Roque et al., 2017). Because of this, intervention programs to promote a secure attachment relationship between parents and infants need to be designed to improve developmental outcomes and prevent behavioral problems and psychopathology in at-risk infants at birth (Egeland, 2019). While the baby needs competent and capable parents, not everyone can develop those skills without psychological care. In Spain, despite the recommendations of the guidelines for clinical practice in Neonatology (Ministry of Health, 2014), based on the family-centered care model (24-h stay, offering training and psychological support to the family and encouraging participation in care within the NICU), few hospitals develop specific perinatal psychology programs (Cuéllar & Valle, 2017). There are even fewer that focus their practice on families by having them participate in the NICU and decision-making on the transition home and early care (Vetcho et al., 2019).

More specifically, in our context, there is a significant lack of studies that assess the effectiveness of psychological programs that cater to families of extremely preterm babies. The main objective of this study is to explore the emotional profile of parents with extremely preterm babies at two different times: 1 month after birth and when the baby reaches the corrected age of 12 months after the implementation of a specific psychological program.

Following the literature, we hypothesize that, after the birth of a very premature baby, mothers who take part in the program might present greater emotional distress than fathers and that this state might be related to the infant's clinical situation. Also, the emotional states of fathers and mothers may influence each other. Finally, after the program, the emotional state of the mothers might improve more noticeably than that of their partners. Therefore, a program aimed at training parents to care for very preterm infants during the first year could minimize some of these threats to the well-being of families.

METHOD

Participants and procedure

In this study, the units of analysis are families with high-risk preterm newborns (weight ≤ 1500 g and/or gestational age ≤ 32 weeks), single-parent or two-parent families, and single- or multiple-births in a public hospital. Although single-parent families were not excluded in this study, none ultimately participated. It is our understanding that the applied psychological intervention program, the Parental Empowerment Program, will benefit all these parents so excluding families could put the external validity of the study at risk, as well as cause ethical discrimination. This is a single-arm pilot study to explore possible impact areas of the program in the emotional state of very preterm infants' parents and to characterize the possible population for whom the program would be helpful.

Recruitment occurred in the community hospital in which the research was conducted. This hospital did not offer any other educational or psychological intervention for parents of very preterm babies when this program was implemented, and served a population with a wide socioeconomic and educational range.

Specifically, the sample was made up of 100 participants (50 two-parent families) with age of $M = 37.838$ ($SD = 4.43$, range 29–51). The mothers' age was $M = 36.76$ years ($SD = 4.298$) and the fathers' age, $M = 38.94$ years ($SD = 4.332$). Referring to the education levels, 45.5% had completed university education, 37.4% secondary, 16.2% primary, and 1% had not finished their primary education.

Selection

All the procedures carried out in studies involving human participants were done by the ethical standards of the institution and with the Helsinki declaration. This study has been approved by the Ethical Research Committee of Virgen del Rocío University Hospital in Seville (2013PI/361). Informed consent was obtained from all the individual participants included in the study.

The parents and their babies were assessed and monitored by the medical team and by psychologists from a third-level hospital in the south of Spain. Data were obtained on the parents' emotional state, using questionnaires that focused on any stress, depression, and resilience experienced.

In the Neonatal Management Unit, between April 2014 and May 2015, the total number of newborns attended was 1156. Survivor high-risk preterm newborns with geographical availability and whose parents could be contacted, numbering 115, were included. All the families that met the criteria during this period were invited to participate. After this first contact, the reasons for excluding were parental language difficulties, infants suffering from severe neurological sequelae, infant death, distance from their new residence, parents' dropping out, scheduling difficulties to attend parent meetings, and absence of perception of need or risk. The number of participants was 60 infants and their parents. The clinical characteristics of babies excluded from the study did not statistically differ from the characteristics of babies included. In the case of twins, the infant with the worst clinical situation at birth was selected for the analyses, in line with Pace et al. (2016). Therefore, parental participation in the study was recorded only once (there were no siblings in the sample). Finally, our sample was 50 infants and 50 couples (Figure 1).

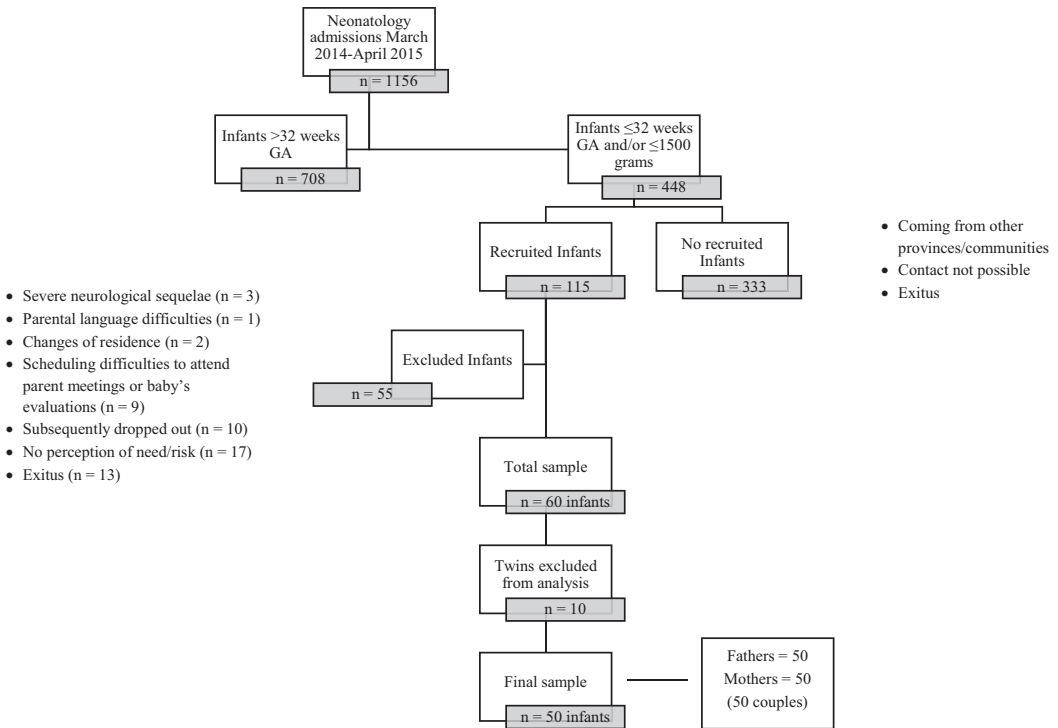


FIGURE 1 Flow diagram showing the distribution of the children in the study. GA, gestational age.

Intervention

The *Parental Empowerment Program* is based on emotional support and parental training (information, demonstration, discussion, and active commitment to professional feedback) to strengthen parents' ability to care for their child and the couple's relationship. In this way, it addresses the two key intervention approaches proposed by Egeland (2019) and Egeland et al. (2000) to promote positive change (a secure attachment relationship) in the interaction between parents and high-risk children. The effectiveness of these intervention approaches has obtained empirical support in several contexts, such as young German high-risk mothers and their newborn infants (Suess et al., 2016), American parents (Heinicke et al., 1999), or Dutch mothers (Van Zeijl et al., 2006).

In addition, key components detected in the meta-analysis by Benzies et al. (2013) on intervention programs for premature babies and their parents were introduced. We also took as references to develop our program other guidelines and recommendations from experts (Chacón-Moscoso et al., 2023; Garrido-Eguizábal et al., 2008; Largaía et al., 2008; McClure, 2008; Padilla-Muñoz et al., 2004; SEN, 2005; Vandenberg & Hanson, 2013; Wilson & Luciano, 2002).

Focusing on promoting family involvement in neonatal care (Vetcho et al., 2019), the objective of the intervention was to identify and manage emotions and promote parenting skills. The program was implemented from the first month of life to 12 months of corrected age of the newborn and consisted of 12 sessions, of 120 min duration, and monthly periodicity. Each of the six groups of parents with which we worked was made up of 8–12 families. The subjects of the sessions were distributed in response to the follow-up phase and corrected age of the infants (see Table 1). The follow-up was done by a group of four health psychologists. All groups received the same sessions, and the content and materials were agreed beforehand

TABLE 1 Description of the psychological intervention program to improve the readiness levels of fathers and mothers of high-risk premature newborns (Garrido-Eguizábal et al., 2008; Largaña et al., 2008; McClure, 2008; Padilla-Muñoz et al., 2004; SEN, 2005; Vandenberg & Hanson, 2013; Wilson & Luciano, 2002).

Periods	Sessions	Description of contents
First stage (birth-2 month CA): First emotions and care	<i>Session 1: "The first emotions"</i>	<i>Parent-child bond. A child who is different from what we imagined. Influence of accepting the child on the final development. States of awareness of the baby</i>
	<i>Session 2: "My emotions now... I learn how my baby communicates"</i>	<i>Identifying our own emotions. The way our babies communicate, and how we can relate to them</i>
	<i>Session 3: "What have I learned from my baby?" and "how to handle emotions?"</i>	<i>Using our babies' signals to get to know them better and promoting safety, attachment, and well-being. Emotional Self-Care Guidelines for Parents</i>
Second stage (2–6 months CA): Optimizing development and upbringing	<i>Session 4: "Remembering what we have learned.... How do I see my child?"</i>	<i>Emotional Self-Care Guidelines. The child's perception. The concept of corrected age. Identifying warning signs in the main areas of the baby's development</i>
	<i>Session 5: "Infant massage: Improving affectivity between parents and children"</i>	<i>Affective communication, which encourages and strengthens the bond: massages. Stimulate active listening to detect needs and/or signals displayed by your baby</i>
	<i>Session 6: "Observe your baby's development. Set your priorities."</i>	<i>Differential aspects in the development of the premature baby. The CA and the actual level of development. Learn to prioritize and create your own space</i>
Third stage (6–12 months CA): Care routines and family organization	<i>Session 7: "Communication within the family"</i>	<i>Techniques to improve verbal and non-verbal communication</i>
	<i>Session 8: "Food, sleep, and crying."</i>	<i>Addressing difficulties and providing high-quality care. The development of the premature baby (6–9 months)</i>
	<i>Session 9: "Facing up to our fears and boosting our self-esteem and that of the baby"</i>	<i>Self-esteem and fear: how they are related and how to deal with them. Impact on the baby's development, safety, and well-being</i>
	<i>Session 10: "Self-control and problem-solving"</i>	<i>Concept of self-control. Self-control and problem-solving techniques</i>
	<i>Session 11: "Guidelines for raising your baby: setting limits"</i>	<i>Your baby's daily life and its difficulties. How to tackle them, raising your child with affection</i>
	<i>Session 12: "And now what? Final words and the closing session"</i>	<i>Integration, internalization, and evaluation of what we have learned. Group farewell</i>

Abbreviation: CA, corrected age.

(additional information about the content and materials used in the program is available upon request to the authors).

Assessment (assessment procedure)

A multimodal data collection was carried out. Assessment of the variables related to the emotional impact of the parents was done using standardized questionnaires, one month after the

preterm baby was born (before the first session of the program) and at 12 months of corrected age. In addition, clinical variables of the newborn premature baby were taken from the electronic medical record.

Measures

The parents completed four questionnaires and information was collected from the newborn's medical history.

In selecting these instruments, it was taken into account that the topics should be of interest to this target population (Borghini et al., 2014; Brunson et al., 2021; Shaw et al., 2013) and that they should address both risk and protective factors. Also, they were validated in Spanish or Hispanic populations, and that data had been collected in similar risk populations (Caruso & Mikulic, 2010; Schechter et al., 2020).

Satisfaction with the intervention

A questionnaire ad-hoc was filled out after finishing the program to obtain information about the degree of parents' satisfaction with the intervention received. They were asked about aspects such as their perception of psychological attention for babies and parents, the information received, or the usefulness of the intervention.

Inventory for family potential resilience (IFPR, Caruso & Mikulic, 2010)

It evaluates the degree of resilience potential in a family with a newborn admitted to a NICU. It has 36 items (five of which do not sum for scores) with 5 response options, from least (0) to most agreed (4), and four factors: *Family Work* (FW: identifies different elements of family functioning such as stability, changeability, and positivity (seven items, range [0–28])); *Family Belief Systems* (FBS: evaluates faith and transcendental beliefs (five items, range [0–20])); *Clarity and Sincere Emotional* (CSE: assesses the possibility that exists in the family to express and share feelings freely and to talk about problems (10 items, range [0–40])); and *Cooperative Problem Resolution* (CPR: assesses the family's ability to jointly identify and address problems (9 items, range [0–36])). When transformed into percentiles, they allow families to be classified as high resilience potential (high ≥ 67), medium (34–66), and low (≤ 33), as indicated in the test description. A Cronbach's alpha of 0.96 was reached (Caruso & Mikulic, 2010); and validity evidence based on other variables was found, obtaining $r_s = 0.600$, $p < 0.001$ as correlation with the Effectiveness of Family Functionality Scale (Rico-Pérez, 2020). In the sample of this study, Cronbach's alpha was 0.84.

State/trait depression questionnaire (STDS, Spielberger et al., 2008)

It has 20 items to assess symptoms of depression, both the specific condition (STATE) and the general disposition (TRAIT) of affectivity. It covers both the presence of negative affectivity (Dysthymia, DYS) and the absence of positive affectivity (Euthymia, EUT). All statements show four response options, from least to most agreed. To perform a categorization based on percentiles, the cut-off point of 75 was used as a reference, as stated in the test manual, which indicates clinical symptomatology. Three levels are set: low ≤ 25 , medium 26–74, and high ≥ 75 . High levels of reliability (0.84–0.90) are also obtained, and the promax rotation shows the

two factors on each scale. Cronbach alphas in the current sample were adequate (0.69–0.94) (George & Mallery, 2003).

Posttraumatic stress disorder questionnaire (PSDQ, Crespo & Gómez, 2012)

This self-report, easy to application and correction, allows assessment of Post-Traumatic Stress Disorder (PTSD) based on DSM-IV criteria. Composed of 62 items, it explores symptoms related to *Reexperimentation, Evading and Affective Weakness (EAW), Hyperactivation, Functioning* and *Subjective Clinical Symptoms (SCS)*. They are grouped into *Total post-traumatic symptoms diagnosed (Total)* and *Total Post-traumatic Symptoms and Subjective Clinical Symptoms (Total+SCS)*. All statements show five response options, from least to most agreed. In the test manual, three levels are established based on percentiles: low <20, medium 20–80, and high >80. It was validated in a Spanish adult population (Crespo & Gómez, 2012), and presented adequate psychometric properties, with high levels of reliability (alpha between 0.78 and 0.92) and validity evidence based on the internal structure of the test and based on other variables (convergent and predictive validity). In the sample of this study, Cronbach's alphas were mostly adequate (with values between 0.50 and 0.93) (George & Mallery, 2003).

Clinical variables of the premature baby

Data on gestational age (in weeks), birth weight (grams), time in the NICU (days), days on mechanical ventilation, and time of initiation of corticosteroids (measured in days after birth) were taken from the electronic medical record.

Data analytic strategy

Power analysis

The adequacy of the sample size available to obtain the rejection of the null hypothesis when there were differences between groups was tested using the software G*Power 3 (Faul et al., 2007). The statistical test taken for the calculations was a *t*-test for matched groups (given the pre-posttest nature of the data). The input parameters chosen were two tails, a medium effect size (0.5), $\alpha=0.05$, and $1-\beta=0.9$.

Inferential analyses

SPSS version 28 was used for all the inferential analyses. Missing data in parents' measurements were recovered using multiple imputations for continuous variables with the use of predictive-mean matching, a strategy that maintains the same characteristics in the raw data; and it does not require normal distribution, given that the imputed variables are drawn from an observed empirical distribution instead of a parametric distribution (Austin et al., 2021). There were no missing data in the babies' measurements.

Depending on the kind of variable to relate, *t*-test, ANOVA, and Pearson correlation were applied when the normality assumption (Kolmogorov–Smirnov *Z*) was met. Wilcoxon, McNemar, Spearman, and Kruskal Wallis tests were used when the normal distribution was not accepted. In all cases, Bonferroni correction was applied: the significance level for comparison was calculated as α/C ; $\alpha=0.05$ (type II error for a CI=0.95) and C is the number of

comparisons; p values below the result implied statistically significant differences between groups or relationships between variables.

In addition, dyadic analysis was carried out for the total scores when the assumption of dependence across couples' scores was met (when Spearman correlations obtained $p < 0.005$) (Alferes & Kenny, 2009; Kenny et al., 2006). An actor–partner interdependence model (APIM) was used.

Objective 1A. Emotional profile of fathers and mothers during pre-test

To study the emotional profile of parents at the moment their child is born, descriptive statistics (means, standard deviations, and minimum and maximum values) were calculated for IFPR, STDS, and PSDQ during pre-test (subscales and global scores, for fathers and mothers separately).

To study whether there were differences in the emotional profile between fathers and mothers, paired t -test or Wilcoxon signed ranks test were used. In addition, a McNemar test was calculated after categorizing the results in IFPR, STDS, and PSDQ based on percentiles.

Finally, to perform dyadic analyses, correlations between measures of mother and father were calculated. After that, an APIM was applied. The estimation procedure used was Restricted Maximum Likelihood (REML). This analytic approach allows studying if each person's resilience and post-traumatic stress disorder are associated with their depressive symptoms, or if person's resilience and post-traumatic stress disorder are associated with their partner's depressive symptoms. The APIM examined, in one model, actor and partner effects of resilience (global measure) and post-traumatic stress disorder (global measure) on total state depression (this is understood as more dependent on the context than the total trait depression).

Objective 1B. Relationship between parents' emotional profile and babies' clinical variables

We studied the relationship between babies' clinical variables (gestational age, weight, days in NICU, days with mechanical ventilation, and moment of beginning with corticoids) and parents' emotional profiles (IFPR, STDS, and PSDQ) in the pre-test. Pearson or Spearman correlation was calculated. Furthermore, the Spearman correlation was calculated relating the same infant clinical variables and the IFPR, STDS, and PSDQ variables previously categorized in low, medium, and high levels.

We did not include babies' clinical variables in an APIM model. They were explored as potential covariates but were not included in the dyadic analysis because of their nonsignificant bivariate correlations with parents' emotional variables (Kenny et al., 2006).

Objective 2. Comparison of parents' emotional profile before and after the psychological program

We contrasted measurements pre- and post-intervention to check if there was a change in the emotional profile, using paired t -test or Wilcoxon signed ranks test. In addition, we used the McNemar test to determine the differences between pre- and post-test after categorizing the results in the dependent variables.

To study whether the level of prematurity of children influenced parents' emotional profile, we conducted mixed ANOVA or Kruskal–Wallis tests. Attending to the criteria established by the World Health Organization (2018), the level of prematurity was coded based on the number of weeks of gestation: extreme preterm (0 = 27 or less), and very preterm (1 = from 28 to 32).

Finally, dyadic analysis was carried out to study couples as units. First, bivariate correlations between mothers and fathers' measures were performed (Jocson, 2020). Then, an APIM model for person-period pairwise for distinguishable dyad members was calculated to study the possible change in state depression related to resilience and post-traumatic stress disorder (Lampis et al., 2019).

RESULTS

Adherence to the intervention

Over the 12 sessions that formed the intervention, at least one parent of the couple attended an average of 5.50 sessions ($SD=3.36$). On most occasions, they brought their babies to the sessions. On average, fathers attended 2.75 sessions ($SD=3.45$) and mothers, 5.23 ($SD=3.46$), a difference statistically significant, $Z=4.325$, $p<0.001$. The main reason for absence was employment.

Parents' opinion about the intervention was positive, considering adequate psychological attention to babies and parents, problem-solving, and information given by the psychologist (it was considered clear and adapted to the needs of the moment, and gave calm to parents). A positive aspect highlighted by families was that the intervention provided contact with families in their same situation, so the support network increased. All participants considered that the intervention was useful.

Power analysis

The computed required sample size obtained was 44. It was concluded that in general, based on the 50 couples available in the sample, significance tests do not seem to be affected by problems of low power.

Objective 1A. Emotional profile of fathers and mothers during pre-test

Table 2 presents descriptive statistics in pre-test for fathers and mothers separately, in IFPR, STDS y PSDQ (subscales and global scores).

One month after the birth of the baby, on the basis of the total scores, parents have medium levels of resilience and symptoms of depression. In post-traumatic stress, the levels were low for fathers and mothers and average on SCS for mothers. After applying Bonferroni correction, $p=0.05/18$ contrasts = 0.0028. Some differences between fathers and mothers in emotional profile were obtained. Statistically significant differences were found in the STDS, where mothers had higher scores in state euthymia ($W=-3.622$, $p<0.001$) and in trait dysthymia ($W=-3.404$, $p<0.001$). There were also statistically significant differences in the PSDQ, where mothers obtained higher averages than fathers in Evading and Affective Weakness ($W=-3.815$, $p<0.001$), SCS ($W=-4.421$, $p<0.001$), the PSDQ Total score ($W=-3.905$, $p<0.001$), and the PSDQ Total score plus SCS ($W=-3.851$, $p<0.001$). The significant differences are similar when calculating McNemar after categorizing the variables based on the percentiles (Table 3).

As a preliminary analysis before the dyadic analysis (APIM), Table 4 presents the bivariate correlations of the variables resilience (global measure), post-traumatic stress disorder (global measure), and total state depression in pre-test.

Maternal levels in total post-traumatic symptoms and SCS had a statistically significant and positive association with total state depression. This same association was found in fathers (more Total post-traumatic symptoms and SCS, more depression). Last, maternal and paternal resilience was significantly and positively correlated, as well as maternal and paternal Total post-traumatic symptoms and SCS. In addition, paternal depression correlated significantly and positively with maternal Total post-traumatic symptoms and SCS, and paternal resilience correlated significantly and negatively with maternal Total post-traumatic symptoms and SCS.

Figure 2 shows the results of the APIM. For mothers, a point increase in their Total post-traumatic symptoms and SCS level was associated with a 0.589-point increase in their own

TABLE 2 Objective 1A. Emotional profile during the pre-test. Differences between fathers and mothers.

	Fathers (N=50)					Mothers (N=50)					Normality (N=100)			Contrast <i>t</i> / <i>W</i> (N=50)			McNemar test (N=50)		
	L	U	M	S		L	U	M	S		Z	p	<i>t</i> / <i>W</i>	p	χ^2	df	p		
IFPR																			
FW	10	85	48.30	19.43	10	80	43.00	22.41	0.098	0.020	1.540 (<i>W</i>)	0.040	8.506	3	0.037				
FBS	5	95	30.30	23.27	5	95	37.30	24.97	0.131	<0.001	-1.919 (<i>W</i>)	0.055	4.123	3	0.248				
CSE	5	95	54.50	24.91	5	90	49.20	25.16	0.119	0.001	1.420 (<i>W</i>)	0.155	2.600	3	0.457				
CPR	5	95	67.10	23.09	5	95	63.20	26.76	0.178	<0.001	0.943 (<i>W</i>)	0.346	1.800	3	0.615				
Total	5	95	49.90	22.73	5	85	48.20	23.21	0.107	<0.006	0.612 (<i>W</i>)	0.540	3.773	3	0.287				
STDS																			
State EUT	1	99	46.56	31.00	10	99	64.22	23.65	0.093	0.032	-3.622 (<i>W</i>)	<0.001	10.600	3	0.014				
State DYS	1	99	42.82	37.77	1	99	58.10	25.22	0.144	<0.001	-2.516 (<i>W</i>)	0.012	16.000	3	0.001				
State TOTAL	1	99	47.82	30.83	10	99	62.82	23.84	0.083	0.087	-3.251 (<i>t</i>)	0.002	9.694	3	0.021				
Trait EUT	1	85	33.94	21.99	1	95	40.80	22.47	0.120	0.001	-1.586 (<i>W</i>)	0.113	2.067	3	0.559				
Trait DYS	1	90	30.32	28.78	25	85	48.28	14.26	0.152	<0.001	-3.404 (<i>W</i>)	<0.001	17.460	3	<0.001				
Trait TOTAL	1	90	30.72	23.27	5	90	41.06	20.55	0.106	0.007	-2.404 (<i>W</i>)	0.016	10.048	3	0.018				
PSDQ																			
Reexperimentation	3	80	14.12	14.83	3	55	16.70	11.11	0.242	<0.001	-1.753 (<i>W</i>)	0.080	5.263	1	0.019				
EAW	5	65	9.80	11.02	5	75	19.50	17.15	0.311	<0.001	-3.815 (<i>W</i>)	<0.001	11.529	1	<0.001				
Hyperactivation	0	75	15.00	14.18	5	80	21.40	18.01	0.218	<0.001	-2.397 (<i>W</i>)	0.017	4.500	1	0.031				
SCS	1	45	13.24	8.76	5	95	28.40	21.10	0.218	<0.001	-4.421 (<i>W</i>)	<0.001	12.190	1	<0.001				
Total	1	65	10.72	11.73	1	65	17.44	12.83	0.226	<0.001	-3.905 (<i>W</i>)	<0.001	7.692	1	0.003				
Total+SCS	1	80	9.94	12.634	2	80	17.60	15.83	0.311	<0.001	-3.851 (<i>W</i>)	<0.001	6.750	1	0.006				
Functioning	5	70	10.30	9.97	1	45	12.72	11.51	0.266	<0.001	-1.171 (<i>W</i>)	0.242	2.083	1	0.146				

Note: Results significant ($p < 0.00028$) are marked in bold.

Abbreviations: CPR, Cooperative Problem Resolution; CSE, Clarity and Sincere Emotional Expression; DYS, Dysthymia; EAW, Evading and Affective Weakness; EUT, Euthymia; FBS, Family Beliefs Systems; FW, Family Work; IFPR, Inventory for Family Potential Resilience; L, lowest value obtained; M, McNemar test; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms; STDS, State – Trait Depression; *t*, paired samples Student *t* test; U, upper value obtained; *W*, Wilcoxon signed ranks test; Z, Kolmogorov–Smirnov Z.

TABLE 3 Statistically significant results in objective 1A.

	Variable	Differences mothers – fathers
STDS	State EUT	Mothers (M = 64.22) – fathers (M = 46.56)***
	Trait DYS	Mothers (M = 48.28) – fathers (M = 30.32)***
PSDQ	EAW	Mothers (M = 19.50) – fathers (M = 9.80)***
	SCS	Mothers (M = 28.40) – fathers (M = 13.24)***
	Total	Mothers (M = 17.44) – fathers (M = 10.72)***
	Total + SCS	Mothers (M = 17.60) – fathers (M = 9.94)***

Abbreviations: DYS, Dysthymia; EAW, Evading and Affective Weakness; EUT, Euthymia; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms; STDS, State – Trait Depression.

*** $p \leq 0.001$.

TABLE 4 Objective 1A. Bivariate correlations in the pre-test.

Variable	1	2	3	4	5	6
1. Mother: IFPR Total	–					
2. Mother: STDS State Total	–0.069	–				
3. Mother: PSDQ Total + SCS	–0.227	0.362**	–			
4. Father: IFPR Total	0.597***	–0.060	–0.382**	–		
5. Father: STDS State Total	0.045	0.255	0.383**	–0.275	–	
6. Father: PSDQ Total + SCS	–0.009	0.065	0.505***	–0.116	0.394**	–

Note: $N = 50$ dyads (100 individuals).

Abbreviations: IFPR, Inventory for Family Potential Resilience; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms; STDS, State – Trait Depression.

** $p < 0.01$. *** $p < 0.001$.

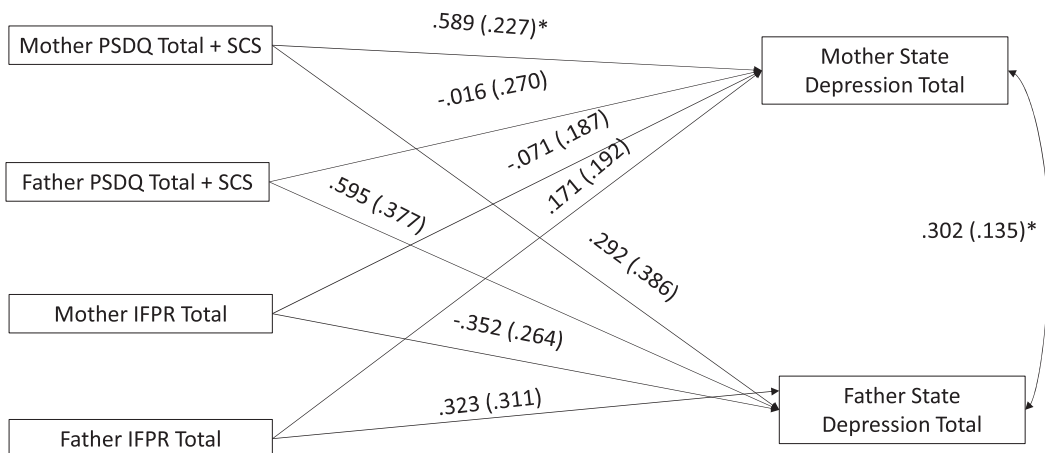


FIGURE 2 APIM in the pretest included mothers' depression, posttraumatic stress disorder, and resilience; and fathers' depression, posttraumatic stress disorder, and resilience. Numbers shown are unstandardized estimates (numbers in parentheses are standard errors). IFPR, Inventory for Family Potential Resilience; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms.

state depression ($B=0.589$, 95% CI [0.132, 1.045], $p=0.013$). In addition, mothers and fathers' depression correlated significantly and positively.

Although the results were not significant, for fathers, a point increase in their Total post-traumatic symptoms and SCS level was associated with a 0.595-point increase in their own state of depression. The partner effects on depression were not statistically significant. For example, it was found that a one-point increase in mothers' resilience implied a decrease of -0.352 -point in fathers' depression; and a one-point increase in fathers' resilience implied a decrease of -0.071 -point in mothers' depression (but without statistically significant results).

Objective 1B. Relationship between parents' emotional profile and babies' clinical variables in the pre-test

The descriptive statistics and the normality assumption testing for clinical variables of the babies can be consulted in [Table S1](#). The results of the normality tests for parents' variables are available in [Table S2](#).

[Table 5](#) presents the study of the relationships between parents' emotional profiles and babies' clinical variables. Applying Bonferroni correction, considering there were 180 correlations (36 parents' variables \times 5 babies' variables), $p < 0.0003$ ($0.05/180$) was considered significant. There were no significant relationships.

[Table S3](#) presents the relationships between the parents' emotional profile and the babies' clinical variables when the parents' emotional characteristics were categorized as low, medium, and high based on their percentiles. Again, applying Bonferroni correction, $p < 0.0003$ were considered significant. No correlations reached significance.

Objective 2. Comparison of parents' emotional profile before and after the psychological program

[Table S4](#) presents the change in the emotional profile comparing the pre-test and post-test. Applying Bonferroni correction, $p = 0.05/36$ contrasts = 0.0014 . Significant decreases were found for mothers, in Cooperative Problem Resolution, $W = -4.074$, $p < 0.001$; State Euthymia, $W = -4.639$, $p < 0.001$; State Total, $W = -3.818$, $p < 0.001$, and Trait Dysthymia, $W = -3.508$, $p < 0.001$. For fathers, the significant decreases were found in State Dysthymia, $W = 4.084$, $p < 0.001$, Hyperactivation, $W = -3.585$, $p < 0.001$, and Total post-traumatic symptoms plus SCS, $W = -3.320$, $p < 0.001$.

[Table S5](#) presents the differences in emotional profile comparing pre and post-test after categorizing emotional profile in low, medium, and high. Applying Bonferroni correction, $p = 0.05/36$ contrasts = 0.0014 . Statistically significant differences were found in mothers with a decrease in post-test, referring to State Euthymia. In fathers, there was a statistically significant tendency towards decrease in post-test measurements in Clarity and Sincere Emotional expression, State Dysthymia and Hyperactivation. [Table 6](#) presents the statistically significant results included in [Tables S4](#) and [S5](#).

[Table S6](#) presents the results from studying the influence of the degree of prematurity on parents' emotional profile before and after the intervention. It can be said that the degree of prematurity did not affect parents' emotional profile.

Referring to the dyadic analysis (APIM), as preliminary analysis, [Table 7](#) presents the bivariate correlations of each of the variables resilience (global measure), post-traumatic stress disorder (global measure including SCS) and total state depression across role (father, mother) and measurement occasion (pre and post-test).

TABLE 5 Objective 1B: Relationships between parents' emotional profile and babies' clinical variables during pre-test.

	Role	Gestational age (weeks) (N=50)		Weight (grams) (N=50)		Time in NICU (days) (N=50)		Mechanical ventilation, days (N=50)		Age when began corticoids (N=16)	
		ρ	<i>p</i>	<i>r</i> / <i>p</i>	<i>p</i>	ρ	<i>p</i>	ρ	<i>p</i>	<i>r</i> / <i>p</i>	<i>p</i>
IFPR											
FW	Father	-0.092	0.525	0.063 (<i>p</i>)	0.664	-0.026	0.856	0.128	0.374	-0.294 (<i>p</i>)	0.269
	Mother	-0.060	0.679	0.000 (<i>r</i>)	0.998	0.049	0.736	0.080	0.582	-0.151 (<i>r</i>)	0.577
FBS	Father	0.051	0.726	0.017 (<i>p</i>)	0.907	-0.091	0.530	-0.033	0.819	-0.107 (<i>p</i>)	0.693
	Mother	0.161	0.264	0.041 (<i>p</i>)	0.776	-0.134	0.355	-0.061	0.676	-0.105 (<i>p</i>)	0.700
CSE	Father	-0.134	0.353	-0.143 (<i>p</i>)	0.323	0.165	0.254	0.159	0.271	-0.293 (<i>p</i>)	0.271
	Mother	-0.100	0.492	0.035 (<i>r</i>)	0.808	0.147	0.309	0.191	0.184	-0.194 (<i>r</i>)	0.471
CPR	Father	-0.059	0.682	0.131 (<i>p</i>)	0.363	0.077	0.594	0.112	0.437	-0.296 (<i>p</i>)	0.265
	Mother	-0.328	0.020	-0.125 (<i>p</i>)	0.387	0.265	0.063	0.268	0.059	0.156 (<i>p</i>)	0.563
Total	Father	-0.048	0.739	-0.096 (<i>r</i>)	0.506	0.063	0.664	0.118	0.414	-0.284 (<i>r</i>)	0.286
	Mother	-0.094	0.518	-0.040 (<i>p</i>)	0.782	0.150	0.298	0.183	0.203	-0.287 (<i>p</i>)	0.282
STDS											
State EUT	Father	-0.123	0.395	0.041 (<i>p</i>)	0.778	0.237	0.098	0.312	0.027	-0.202 (<i>p</i>)	0.454
	Mother	-0.165	0.251	-0.138 (<i>r</i>)	0.339	0.262	0.066	0.219	0.127	-0.240 (<i>r</i>)	0.371
State DYS	Father	0.029	0.843	0.055 (<i>p</i>)	0.703	-0.005	0.975	0.028	0.845	-0.158 (<i>p</i>)	0.559
	Mother	-0.160	0.266	-0.133 (<i>p</i>)	0.357	0.305	0.031	0.234	0.102	-0.269 (<i>p</i>)	0.314
State TOTAL	Father	-0.093	0.520	0.036 (<i>p</i>)	0.802	0.208	0.148	0.256	0.072	-0.267 (<i>p</i>)	0.317
	Mother	-0.113	0.435	0.110 (<i>r</i>)	0.448	0.222	0.120	0.184	0.202	0.037 (<i>r</i>)	0.893
Trait EUT	Father	0.010	0.947	0.011 (<i>p</i>)	0.939	-0.114	0.924	-0.012	0.933	-0.435 (<i>p</i>)	0.092
	Mother	0.031	0.828	0.077 (<i>p</i>)	0.594	-0.077	0.594	-0.051	0.723	-0.005 (<i>p</i>)	0.987
Trait DYS	Father	-0.112	0.440	0.063 (<i>p</i>)	0.664	-0.033	0.818	0.080	0.581	-0.136 (<i>p</i>)	0.615
	Mother	-0.124	0.392	0.134 (<i>p</i>)	0.354	0.062	0.669	-0.021	0.885	0.024 (<i>p</i>)	0.929

TABLE 5 (Continued)

	Role	Gestational age (weeks) (N = 50)		Weight (grams) (N = 50)		Time in NICU (days) (N = 50)		Mechanical ventilation, days (N = 50)		Age when began corticoids (N = 16)	
		ρ	<i>p</i>	<i>r</i> / <i>p</i>	<i>p</i>	ρ	<i>p</i>	ρ	<i>p</i>	<i>r</i> / <i>p</i>	<i>p</i>
Trait TOTAL	Father	-0.053	0.716	0.031 (<i>p</i>)	0.830	0.028	0.845	0.101	0.484	-0.312 (<i>p</i>)	0.240
	Mother	0.012	0.936	0.099 (<i>p</i>)	0.495	0.008	0.958	-0.040	0.784	-0.034 (<i>p</i>)	0.901
PSDQ											
Reexperimentation	Father	-0.009	0.951	0.105 (<i>p</i>)	0.467	-0.032	0.826	0.049	0.735	-0.388 (<i>p</i>)	0.138
	Mother	-0.76	0.221	-0.232 (<i>p</i>)	0.105	0.239	0.095	0.228	0.111	-0.260 (<i>p</i>)	0.331
EAW	Father	-0.005	0.975	0.028 (<i>p</i>)	0.844	0.073	0.613	0.043	0.769	-0.070 (<i>p</i>)	0.798
	Mother	-0.138	0.339	-0.149 (<i>p</i>)	0.300	0.295	0.037	0.211	0.142	0.052 (<i>p</i>)	0.849
Hyperactivation	Father	-0.143	0.322	-0.063 (<i>p</i>)	0.666	0.041	0.776	0.057	0.695	-0.408 (<i>p</i>)	0.117
	Mother	-0.381	0.006	-0.270 (<i>p</i>)	0.058	0.358	0.011	0.277	0.051	0.168 (<i>p</i>)	0.491
SCS	Father	-0.035	0.809	0.016 (<i>p</i>)	0.913	0.065	0.652	0.043	0.767	-0.041 (<i>p</i>)	0.880
	Mother	-0.077	0.593	-0.172 (<i>p</i>)	0.231	0.157	0.278	0.043	0.768	-0.149 (<i>p</i>)	0.581
Total	Father	-0.092	0.527	-0.026 (<i>p</i>)	0.860	0.052	0.721	0.046	0.750	-0.306 (<i>p</i>)	0.249
	Mother	-0.258	0.071	-0.258 (<i>p</i>)	0.070	0.369	0.008	0.299	0.035	0.029 (<i>p</i>)	0.916
Total + SCS	Father	-0.177	0.219	-0.048 (<i>p</i>)	0.739	0.130	0.367	0.120	0.406	-0.410 (<i>p</i>)	0.115
	Mother	-0.192	0.181	-0.213 (<i>p</i>)	0.138	0.277	0.051	0.193	0.179	-0.256 (<i>p</i>)	0.338
Functioning	Father	-0.013	0.928	0.168 (<i>p</i>)	0.244	-0.141	0.327	-0.106	0.463	-0.022 (<i>p</i>)	0.936
	Mother	-0.100	0.488	-0.014 (<i>p</i>)	0.924	0.094	0.518	0.178	0.217	0.372 (<i>p</i>)	0.156

Note: There were no significant correlations ($p < 0.0003$).

Abbreviations: CPR, Cooperative Problem Resolution; CSE, Clarity and Sincere Emotional Expression; DYS, Dysthymia; EAW, Evading and Affective Weakness; EUT, Euthymia; FBS, Family Beliefs Systems; FW, Family Work; IFPR, Inventory for Family Potential Resilience; PSDQ, Posttraumatic Stress Disorder Questionnaire; *r*, Pearson correlation; SCS, Subjective Clinical Symptoms; STDS, State – Trait Depression; ρ , Spearman correlation.

TABLE 6 Statistically significant results in objective 2.

	Variable	Role	Differences in pre-test / post-test
IFPR	CSE	Father	Lower values in post-test ^{***, b}
	CPR	Mother	Pre-test (M = 63.20) – Post-test (M = 45.00) ^{***, a}
STDS	State EUT	Mother	Pre-test (M = 64.22) – Post-test (M = 41.54) ^{***, a} / Lower values in post-test ^{***, b}
	State DYS	Father	Pre-test (M = 42.82) – Post-test (M = 14.88) ^{***, a} / Lower values in post-test ^{***, b}
	State TOTAL	Mother	Pre-test (M = 62.82) – Post-test (M = 45.10) ^{***, a}
	Trait DYS	Mother	Pre-test (M = 48.28) – Post-test (M = 37.10) ^{***, a}
PSDQ	Hyperactivation	Father	Pre-test (M = 15.00) – Post-test (M = 7.20) ^{***, a} / Lower values in post-test ^{***, b}
	Total+SCS	Father	Pre-test (M = 9.94) – Post-test (M = 5.78) ^{***, a}

Note: CPR, Cooperative Problem Resolution; CSE, Clarity and Sincere Emotional expression; DYS, Dysthymia; EUT, Euthymia; IFPR, Inventory for Family Potential Resilience; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms; STDS, State – Trait Depression.

^aSignificant values obtained from Table S4.

^bSignificant values obtained from Table S5.

*** $p \leq 0.001$.

In resilience, all the correlations between mothers and fathers in pre and post-test were positive and statistically significant. In depression, only the relationship between the pre and post-test measures for mothers was significant. In Total post-traumatic symptoms and SCS, statistically significant results were found in 66.67% of the correlations. In addition, relationship between constructs were found: for example, mothers with high resilience in pre-test obtained low values of depression and Total post-traumatic symptoms and SCS in post-test; in post-test, fathers with high levels of resilience had low levels of depression; and also in post-test, mothers and fathers with high levels of depression had high levels of Total posttraumatic stress symptoms+SCS too. Across measurement occasions and role, there were statistically significant associations too; e.g., low levels of Total post-traumatic symptoms and SCS in fathers in the pre-test were related to high levels of resilience in mothers in the post-test.

Figure 3 presents the APIM with the significant associations obtained with resilience, depression and Total post-traumatic symptoms and SCS considering the two measurement occasions (pre and post-test).

In the post-test, high scores in depression for mothers were related to high scores in depression also for fathers. In mothers, a point higher total post-traumatic symptoms and SCS in pre-tests was associated with 0.453-point higher depression in the post-test ($B = 0.453$, 95% CI [0.181, 0.726], $p = 0.001$). In mothers in the post-test, a point higher resilience was associated with 0.349-point lower depression ($B = -0.349$, 95% CI [-0.556, -0.143], $p = 0.001$); and a point higher couple's resilience in the post-test was associated with 0.323-point lower mothers' depression ($B = -0.323$, 95% CI [-0.533, -0.113], $p = 0.003$).

DISCUSSION

The birth of a high-risk preterm infant generates different emotional responses in parents during their first year of life. Based on the results, 1 month after birth, parents do not have clinically significant symptoms associated with post-traumatic stress or depression, and their resilience levels are adequate. The overall emotional state observed may be along the lines of post-traumatic growth (Colville & Cream, 2009; Tedeschi & Calhoun, 2004); i.e.,

TABLE 7 Objective 2. Bivariate correlations across role (father, mother) and measurement occasion (pre and post-test).

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Mother: IFPR Total pre	–											
2. Mother: IFPR Total post	0.616***	–										
3. Father: IFPR Total pre	0.597***	0.352*	–									
4. Father: IFPR Total post	0.446**	0.393**	0.520***	–								
5. Mother: STDS State Total pre	–0.069	–0.384**	–0.060	–0.020	–							
6. Mother: STDS State Total post	–0.378**	–0.452***	–0.041	–0.105	0.359*	–						
7. Father: STDS State Total pre	0.045	–0.229	–0.275	–0.122	0.255	0.011	–					
8. Father: STDS State Total post	–0.259	–0.178	–0.248	–0.490**	0.082	0.167	0.060	–				
9. Mother: PSDQ Total + SCS pre	–0.277	–0.374**	–0.382**	–0.218	0.362**	0.452***	0.383**	0.165	–			
10. Mother: PSDQ Total + SCS post	–0.293*	–0.342*	–0.123	–0.080	0.432**	0.413**	0.118	0.275	0.192	–		
11. Father: PSDQ Total + SCS pre	–0.009	–0.299*	–0.116	–0.230	0.065	0.142	0.394**	0.194	0.505***	0.156	–	
12. Father: PSDQ Total + SCS post	–0.061	–0.058	–0.005	–0.229	0.243	0.228	0.086	0.315*	0.314*	0.315*	0.391**	–

Note: $N = 50$ dyads (100 individuals). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Abbreviations: IFPR, Inventory for Family Potential Resilience; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms; STDS, State – Trait Depression.

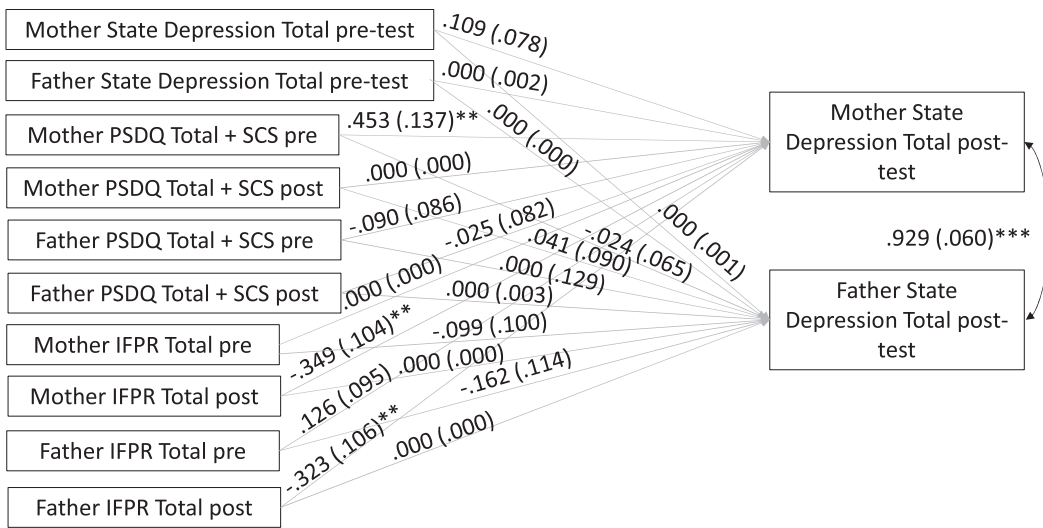


FIGURE 3 APIM includes measures before and after the intervention in mothers' depression, post-traumatic stress disorder, and resilience; and fathers' depression, posttraumatic stress disorder, and resilience. The numbers shown are unstandardized estimates (numbers in parentheses are standard errors). IFPR, Inventory for Family Potential Resilience; PSDQ, Posttraumatic Stress Disorder Questionnaire; SCS, Subjective Clinical Symptoms.

to achieve better levels of resilience and other protective factors while reducing risk variables (stress and depression), as a result of the personal change that they may experience. Low levels of stress were found in mothers who were actively involved in the NICU, where their caregiver role was enhanced and it helped them to cope with the experience (Harris et al., 2018). Mothers also use a greater number and more diverse coping strategies than fathers do (Roque et al., 2017).

About the above, an interesting line of research would be to analyze the possible benefits of humanization in neonatal care and developmental-focused care (Perapoch et al., 2006) on the growth of the families themselves. Including families in the NICU routine has benefits for both the baby and the parents (Craig et al., 2015; Sannino et al., 2016).

However, if we categorize the population based on the intensity of symptoms, not everybody achieves scores compatible with emotional well-being. Thus, before the program, over 30% of parents present clinical symptoms in State Euthymia and State Total. The birth of a preterm infant is an experience in which negative and positive emotions are mixed (Roque et al., 2017); where post-traumatic growth factors coexist with signs of trauma, suggesting a multidimensional response to the situation (Masten, 2016).

In relation to the differences found between the parents, the mothers displayed greater discomfort 1 month after the birth than the fathers did. Higher levels of post-traumatic stress in mothers have been reported without reaching clinical levels (Harris et al., 2018). In the same manner, Shaw et al. (2009) state that parents may be hiding their emotional response to support their partner, and Roque et al. (2017) concluded that mothers gain comfort through emotional and psychological support from their partners.

One of the difficulties in intervention studies is including the fathers (Fotiou et al., 2016). Recently, work has appeared with either fathers (Noergaard et al., 2017; Thomson-Salo et al., 2017; Underwood et al., 2017) or with both fathers and mothers (Pace et al., 2016; Schecter et al., 2020), that coincide with our stress or depression results.

Regarding the influence of the baby's health on the emotional state of the parents, we observed that worse health does not imply greater discomfort in the mothers, as no relationship was found between the baby's clinical variables and levels of post-traumatic stress or

depression. Lasiuk et al. (2013) found similar results, associating the parents' emotional distress more to the rupture of their parental role than to the infant's clinical condition. As Schechter et al. (2020) point out, there is not always a relationship between the degree of prematurity and parental stress. In our study, it should be noted that all the babies were very premature, so the adverse situation of admission and separation of the baby may have influenced jointly more than the different clinical variables independently.

After applying the program, post-traumatic stress and depression symptoms decreased in both mothers and fathers, although the differences were greater in the mothers than in the fathers. This coincides with Puthussery et al. (2018) and Shaw et al. (2013) where programs aimed at parental empowerment are able to relieve stress and depressive symptoms in mothers. Also, Winter et al. (2018) and Vriend et al. (2021) note that, although mothers have worse outcomes after the birth of very preterm infant, they improve more than fathers after the intervention. One year after the birth of a premature child, this situation seems to continue to influence the emotional state of the mother. Even in other studies, it is evident after 2 years (Baraldi et al., 2020).

Regarding resilience, we note that, at the end of the program, mothers have less need for help and fathers are less likely to express their emotions. This could suggest that others (including the partner) do not perceive the need for help that the mother had before. And for fathers, in line with Noergaard et al. (2017), it could be a reversion to the traditional role of supporting mothers, hiding their feelings, either because they do not find it easy or perceive it as shameful.

In addition, we note that the results of participation in the program are not influenced by the degree of prematurity. However, this would allow the program to be extended to include parents of premature babies regardless of their gestational age, including all parents of children admitted to the NICU (Schechter et al., 2020). However, we believe that families with children in a more serious condition would gain greater benefit as there is greater uncertainty. In any case, the possible trauma experienced by the parents due to preterm birth may not be related to some specific clinical characteristics of the baby, as already pointed out by Lasiuk et al. (2013), but to the general functioning observed in them (Pace et al., 2016), regardless of the baseline clinical situation.

Finally, the dyadic analysis highlights that maternal depression is associated with both parental resilience and paternal depression, indicating an interrelationship between protective and risk factors in the post-intervention measure. Thus, a good emotional state of the father could be protective of the emotional state of the mother. The relationship between the emotional health of parents during the first year of life of their preterm infant, mainly in mothers, would indicate that it is very necessary to intervene with couples and not with fathers or mothers separately and that the intervention should be more prolonged. The work of Pierrehumbert et al. (2003) observes that post-traumatic stress symptoms affect a higher percentage of mothers 14 months after discharge (40%) than during hospitalization (23%). And similarly, Pace et al. (2020) found that 2 years after birth, one-fifth of the parents still had significant clinical scores in posttraumatic stress. This highlights the need for continued support beyond 12 months, as this period may be insufficient to overcome a traumatic experience such as the birth of a very premature baby. The findings suggest the need to design ad hoc interventions for a population living through traumatic experiences such as admission to the NICU (Chacón-Moscoso et al., 2021, 2023). Including fathers and mothers in the program despite difficulties in maintaining follow-up (Heyman et al., 2019), proposing and developing a program over 12 months, and including resilience as a dependent variable are aspects of interest.

Limitations

The adherence could be a limitation of this study, given that the average number of sessions attended was less than 50%. Increasing attendance could lead to a more significant change.

Therefore, actions to facilitate attendance for future interventions will be implemented, such as the possibility of online attendance or consulting parents for the most suitable schedule when planning the intervention calendar.

The sample size obtained in just one hospital, assessment of emotional status that is only quantitative, and some of the selected instruments, could be considered as limitations (Chacón-Moscoso et al., 2019). In addition, we believe that the ideal situation would imply having a control group to improve internal validity. However, circumstances did not permit this because of several ethical issues. First, all parents who met the inclusion criteria had the same need to participate in the intervention. The hospital management considered it unethical to include one group of parents in the intervention and leave another as a control group. In addition, the parents knew each other. They coincided in common areas of the hospital (such as the waiting room), or the WhatsApp group. There was no way to control some parents in the intervention group from talking about the program to other parents included in the control group, with the discomfort that this could generate.

As an advantage, a decrease in the internal validity could lead to an increase in the external validity. Parents that formed the sample are representative of other parents of very preterm babies in the hospital where the intervention was implemented, and other public hospitals of the same geographic area. In this sense, this study can be considered to be research with high ecological validity. Parents were selected and participated in the intervention in a natural context, which implies that the results obtained can be generalized to similar units in similar settings.

Implications and future directions

The data derived from this study lead us to reflect that fathers and mothers might express and cope with admission of a premature baby to the NICU and its first year of life differently. Mothers seem to be more emotionally impacted by the baby's birth, and we observed a higher degree of emotional well-being in the measurement taken after the end of the program. Fathers display less symptoms at both times.

The different responses of fathers and mothers, and the lack of similar studies in our context, lead us to recommend specific interventions that include risk and protective factors, that always include the couple and that last at least 2 years. These programs would seek a more active involvement in the care of premature babies, and they would be adapted to the clinical situation at birth, to complications and the support of the family environment. Training of health care personnel is also considered important in order to react to the different emotional responses of each parent with greater sensitivity.

The next steps are planned prior to making this program broadly available in hospitals for parents with premature babies. First, the implementation of a follow-up period (at least 1 year after finishing the intervention) to minimize threats to validity and check if the beneficial results are maintained over time. Another proposal is assessing the acceptability of the intervention among hospital personnel (checking if doctors would recommend the program to parents), and especially among parents (the target population). Clinical trials will be applied to demonstrate intervention efficacy (it is expected to apply a design with a randomized control group). Finally, we plan to test the intervention solely with parents experiencing anxiety or other mental health concerns excluding, after a pre-test, those parents who present an adequate emotional profile at the moment of the premature baby's birth.

The possibility of assessing emotional status qualitatively through narrative analysis could help to better understand it, and it is a goal for future research. In addition, as further research, the results found in this study can be compared to other outcomes found with parents of very preterm babies from public hospitals of similar features.

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DATA AVAILABILITY STATEMENT

Database is available at <https://osf.io/4mr9v/>.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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