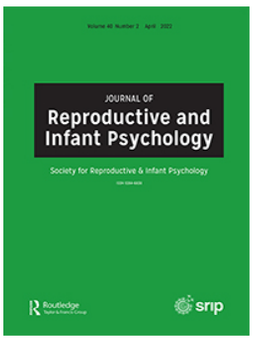

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Journal of Reproductive and Infant Psychology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/cjri20

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To cite this article: Andrea Mira, Soledad Coo & Rodolfo Bastías (2022): Mother's mental health and the interaction with her moderate preterm baby in the NICU, Journal of Reproductive and Infant Psychology, DOI: 10.1080/02646838.2022.2077921

To link to this article: https://doi.org/10.1080/02646838.2022.2077921

Published online: 30 May 2022.

JOURNAL OF REPRODUCTIVE AND INFANT PSYCHOLOGY
https://doi.org/10.1080/02646838.2022.2077921

Mother's mental health and the interaction with her moderate preterm baby in the NICU

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ABSTRACT

Introduction: Moderate preterm infants, born between 320/7 and 336/7 weeks, represent a significant number of preterm-born infants; however, they remain a poorly studied group despite their vulnerability. The objective of this correlational study is to describe the impact of having a moderate preterm infant hospitalised in the NICU on the mothers' mental health and how this relates to the interaction between the dyad. Method: During the hospitalisation period, 85 moderate preterm mother-infant dyads participated in this study. The participants provided self-reports of depression, parental stress, and skin to skin and breastfeeding practices. Also, mother-infant interaction was assessed in the NICU with an observational scale. Results: Mothers evidenced high levels of stress and depressive symptoms during the hospitalization. The stress experienced by these women was significant, although weakly, associated with the interaction with their babies; and mothers of small for gestational age babies showed difficulties in this area. Conclusions: The results of this study could represent a contribution to a better understanding of the relation between the characteristics of moderate preterm babies, maternal emotional wellbeing, and the quality of mother-infant interactions in NICU settings.

ARTICLE HISTORY
Received 9 February 2021
Accepted 7 May 2022

KEYWORDS
Moderate preterm; premature birth; perinatal mental health; mother-infant interaction; neuroprotection; neuroprotective strategies

Introduction

The World Health Organization (WHO) defines preterm birth when babies are born alive before 37 weeks of gestation (WHO, 2018). There are sub-categories of preterm birth based on gestational age, including: extremely preterm (< 28 weeks); very preterm (28 and less than 32 weeks) and moderate to late preterm (32 to 37 weeks). Within the last sub-category, moderate preterm infants are those born between 32 and 34 weeks of gestation (Aylward, 2002, 2014a; Kramer et al., 2012). Around 11% of births in the world correspond to premature births, a rate that has increased in the last 20 years (Blencowe, 2013; Chawanpaiboon et al., 2019; Vogel et al., 2018; Walani, 2020). The moderate and late preterm groups include the largest number (75–85%) of preterm-born infants (Blencowe et al., 2012; Davidoff et al., 2006; Frey & Klebanoff, 2016).

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Premature infants are considered a vulnerable population, having a greater risk of presenting medical and neurobehavioral problems in childhood and adolescence (Aylward, 2014a; Hee Chung et al., 2020; Luu et al., 2017; Saigal & Doyle, 2008). Within these difficulties we can find a lower performance in cognitive tasks, learning problems, and internalising and externalising behavioural problems compared to term children (Aarnoudse-Moens et al., 2009; Hack et al., 2004; Maxwell et al., 2017; Meyers et al., 2019; Yaari et al., 2018). Most of the studies in this population focus on premature infants born with very low birthweight and less than 32 weeks of gestational age, which has led to a limited knowledge of the developmental trajectories of moderate and late premature babies (i.e. born between weeks 32 and 37; García et al., 2019). The few available studies on this topic show that moderate preterm infants are a vulnerable group and that they present more problems in their neurodevelopment compared with their term-born peers (Bogičević et al., 2019; JL Cheong et al., 2017; Engle et al., 2007; Lapillonne et al., 2019).

A great majority of preterm neonates must spend a period of hospitalisation in neonatal care units (NICU), where they are exposed to various, unpleasant stimuli and experiences such as painful medical procedures, drug use, exposure to light and noise (J. L. Cheong et al., 2020; Lahav & Skoe, 2014; Morag & Ohlsson, 2016) and the separation from their parents (Provenzi et al., 2018). Even moderate and late preterm infants are physiologically immature, and exhibit limited compensatory responses to extrauterine stimuli compared to term infants (Engle et al., 2007; Woythaler, 2019). Their brains must grow, mature, and adapt to the extrauterine environment and the experiences they are exposed to in the NICU context may negatively impact their neurodevelopment (Shin, 2020).

There are multiple factors associated with physiological risk conditions, such as the severity of the neonatal trajectory, that is, the initial admission status, the response to medical interventions, the number of medical procedures, and days of hospitalisation (Raju, 2012). The risk associated with prematurity is not homogeneous and may depend on the presence of other factors such as the rearing environment, which may increase or decrease the initial risk conditions (Landry et al., 2001; Pinda et al., 2018; Shah et al., 2013). Sociodemographic factors also play a fundamental role, such as socioeconomic status, social support, the parental educational level, and the mother's physical and mental health status (Anderson et al., 2018; Aylward, 2014a; Chung et al., 2020).

Numerous studies have addressed the stress parents experience during the hospitalisation period of their premature child (Govindaswamy et al., 2019; Ho et al., 2010; Ionio et al., 2019; Shaw et al., 2006; Trumello et al., 2018). During the hospital stay, parents must not only deal with the stressors of the NICU environment but must also face complications or uncertainties regarding their child's health status, physical and emotional separation from their baby, and the stress of parenting (Dudek-Shriber, 2004; Kawafha, 2018; Shaw et al., 2006). High parental stress has been associated with symptoms of maternal postnatal depression (Johansson et al., 2021; Leigh & Milgrom, 2008). Mothers of infants born preterm show a higher rate of postpartum depression than mothers of term infants (28%–40%), especially in the early postpartum period when their infants are still in the NICU (Bernardo et al., 2021; Fredriksen et al., 2019). Similarly, mothers of moderate and late preterm infants report rates of possible depression around 22% and 18%, respectively, one month after NICU discharge (Hawes et al., 2016).

Maternal mental health problems have been significantly associated with difficulties in the mother-infant relationship (Hazell Raine et al., 2020; Leigh & Milgrom, 2008). This is particularly relevant for preterm infants, whose interactions with their mothers (and other caregivers) are affected by the infant's difficulties to regulate his/her physiological states and maintaining an optimal level of alertness (Forcada-Guex et al., 2006; Minde, 2000). Mothers of preterm infants are described as more intrusive, less coordinated, and more prone to overstimulate their babies than mothers of term infants (Feldman, 2007; Granero-Molina et al., 2019; Ionio et al., 2017). Also, premature babies give signals that are often subtle and unclear, due to their difficulty to organise their responses in the visual, affective, and motor modalities. This, in turn, diminishes the parents' abilities to read and respond to their baby's cues (Feldman, 2007; Forcada-Guex et al., 2006).

Despite the significant information about the implications of maternal stress, maternal depression, and the mother-infant relationship in the context of prematurity, few studies have addressed these issues in moderate preterm infants (i.e. 32–34 weeks of gestation). Further, there is limited evidence about these phenomena during the initial hospitalisation period. A better understanding of the interplay between moderate preterm infants' characteristics and maternal stress and symptoms of depression, as well as their impact on the mother-infant interaction during the hospitalisation period is needed to inform the design and implementation of interventions to favour the wellness of late preterm mother-infant dyads. This study has the purpose to describe the impact of having a moderate preterm infant hospitalised in the NICU on the mothers' mental health. An additional aim is to describe how this influences the interaction between the dyad.

Method

Participants

Our study was conducted in a public hospital in the Metropolitan region of Chile. Data was collected between May 2019 and February 2020. Families of moderate preterm infants were recruited at the hospital´s NICU. The study was approved by the Ethics Committees of the University del Desarrollo and the Hospital. Informed consent was obtained from the mothers before participating.

For this study, mothers and their moderately preterm, hospitalised newborns were recruited. The women that were eligible for this study met the following criteria: (1) mothers of babies born between week 32 and 34 of gestation, (2) older than 18 years of age, (3) that the newborn was hospitalised in the NICU, (4) the newborn did not present congenital malformations, cardiac or neurological pathologies, or any genetic syndrome, (3) the mother had a sufficient domain of Spanish (written and oral), (4) the mother did not present problematic use of alcohol and/or drugs, (5) the mother did not present severe psychiatric disorders such as schizophrenia (or psychosis). A total of 85 dyads participated in the study.

Instruments

Perinatal, neonatal, and maternal details were obtained from the medical record at the time of recruitment

Sociodemographic Questionnaire. A questionnaire was developed requesting information on the mothers' level of education, occupation, family income, the constitution of the family group, type of home, support network, and obstetric variables.

Newborn information. Information related to weight, height, gestational age at birth, feeding, medical procedures, the use of skin to skin strategy, medical complications, and hospitalisation duration (in days) was obtained from medical records.

Parental Stress Scale for Neonatal Intensive Care Units (PSS: NICU) (Miles et al., 1993). This instrument measures the perception of parents concerning stressors coming from the physical and psychological environment of the neonatology units. The PSS: NICU scale has 34 questions parents must answer on a Likert scale from 1 (not stressful) to 5 (extremely stressful). The questions are organised into three subscales (Caruso & Mikulic, 2012): (1) Visual and sound aspects of the unit; (2) Appearance and behaviour of the baby; and (3) Parental role alteration. This scale has been used in Chile (Wormald et al., 2015), although no formal validation has been conducted in Chilean populations, it has shown to have good validity and reliability in different countries (Franck et al., 2005; Reid & Bramwell, 2003).

Edinburgh Postpartum Depression Scale (Cox et al., 1987; Jadresic et al., 1995). This scale is a self-report questionnaire with 10 items, which have four possible responses within a range from 0 to 3. A score equal to or greater than 13 is considered a risk indicator for presenting postpartum depression between 4–6 after delivery (Castañón & Pinto, 2008). This scale has been validated in Chile to be used during pregnancy and postpartum period. Researchers report high reliability with a Cronbach's alpha of .77 and specificity (67%) to identify women with depressive symptoms.

*Observation scale of mother-baby bond admitted to the NICU (N-EOV-INC;*Santos, 2017). This observational, 21-item scale assesses the mother-infant interactive behaviours on six functions, namely: (1) Approach function; (2) Incubator Contact Function; (3) Body Function; (4) Visual Function; (5) Verbal Function; (6) Postural function. This scale should be applied during the hospitalisation period in the intensive or intermediate care units. The cut-off score for detecting a risk of problematic mother-baby bond is the 25th percentile and the Z score of −.68. To our knowledge, this is the first study in Chile that has used this scale, no formal validations to use this instrument in Chilean samples have been conducted. Nevertheless, this scale has been used in Latinoamerica before. In the original study of this scale, the interobserver reliability showed a high correlation of the scores with an r not less than .95, $p < .001$. In this research, the evaluators were two health professionals trained in the observation of babies and dyads, and who were also trained in the use of this scale. The degree of agreement between the evaluators was evaluated in 10 observations of mother-infant dyads, the Kappa index was .78, which shows a substantial agreement.

Procedure

This study is part of a longitudinal research project that followed 85 moderate preterm mother-infant dyads from birth until 12 months of infant´s corrected age (This study consisted of four stages or phases, starting when the infant was born until they were 12 months). During hospitalisation (phase one of the study), women who agreed to participate completed the sociodemographic and obstetric questionnaire (e.g. delivery, skin to skin, and breastfeeding), the Parental Stress scale for NICU, and the EPDS. The

mother-infant interaction was assessed and coded with the Observation Scale of Mother-Baby Bond Hospitalised in the NICU (N-EOV-INC). These assessments were performed between the second and third week of hospitalisation. The evaluators carried out most of the evaluations before the first 15 days of hospitalisation. Relevant infant information was obtained from medical records, weight, height, gestational age at birth, and hospitalisation duration (in days).

Analysis

We conducted preliminary analyses to evaluate descriptive information and univariate distributions of the variables for normality and outliers at time 1. Due to the non-normality of the data we used non-parametric analysis like Mann-Whitney U test to assess differences in depressive symptomatology and parental stress, according to immediate skin to skin contact after delivery, EPDS score, and the variable 'small for gestational age'. Also, we used Spearman correlation analysis to assess the associations between the variables. All the analyses were conducted using IBM SPSS 25.

Results

The women in the study ($N = 85$) had a mean age of 29 years (SD = 6.40, Range 18–45), all of them were Latin-American and the great majority were Chilean (81.2%). Most of the participants were either married or living with a partner (77.7%). In terms of education, 31.8% had completed high school, 14.4% had technical education qualifications, and 24.7% had a university degree (see, Table 1). Their babies were born between 32 and

Table 1. Sociodemographic characteristics of the sample.

	% (N)
Age	
18–24	22.4 (19)
25–34	58.8 (50)
>35	18.8 (16)
Nationality	
Chile	81.2 (69)
Venezuela	9.4 (8)
Peru	8.2 (7)
Other Latin American countries	1.2 (1)
Marital status	
Married or lives with partner	77.7 (66)
Single	11.8 (10)
Other (divorced, doesn't live with partner)	10.6 (9)
Educational level	
Incomplete schooling	8.3 (7)
Completed high school	31.8 (27)
Incomplete university or technical studies	21.2 (18)
Completed technical studies	14.4 (12)
Completed university studies	24.7 (21)
Work situation	
Gainfully employed	62.4 (53)
Social support satisfaction	
Low (1–3)	0 (0)
Moderate (4–5)	4.7 (4)
High (6–7)	95.3 (81)
Primiparous	
No	56.5 (48)
Yes	43.5 (37)

Table 2. Information of birth, the child and hospitalisation.

Gestational age	33.20 (SD = .88) weeks
Child weight at birth	2089.60 (SD = 428.48) g.
Child size at birth	44.14 (SD = 2.69) cm.
Apgar 1	7.71 (SD = 1.14)
Apgar 2	8.56 (SD = .49)
Hospital Days	18.87 (SD = 12.64) days
	% (N)
Small for gestational age	28.2 (24)
Spontaneous delivery	85.9 (73)
Difficulties during pregnancy related to the mother's health	84.7 (72)
Type birth	% (N)
vaginal	38.8 (33)
c-section	61.2 (52)
Immediate skin-to-skin contact	34.1 (29)
Skin-to-skin contact during hospitalisation	60 (51)
Baby feeding	% (N)
Breast milk feeding	4.7 (4)
Formula	9.4 (8)
Breast milk feeding and formula	85.9 (73)
Feeding method	% (N)
Nasogastric tube	37.6 (32)
Breast feeding	1.2 (1)
Bottle feeding	11.8 (10)
Nasogastric tube and bottle feeding	9.4 (8)
Breast and bottle feeding	35.3 (30)
Nasogastric tube, breast and bottle feeding	4.7 (4)
Satisfaction with health care professional	% (N)
Low (1–3)	0 (0)
Moderate (4–5)	6 (6)
High (6–7)	94 (79)

34 weeks of gestation (M = 33.20; SD = .88) and the mean weight at birth was 2089.60 gr (SD = 428.48). The mean duration of the baby's hospitalisations was 18.87 (SD = 12.64) days (see, Table 2).

Only 34.1% (n = 29) of the dyads were able to do immediate skin to skin contact after delivery and 60% (n = 51) were able to do skin to skin during hospitalisation, with an average of 27.18 minutes per episode (DS = 12.99) of duration. Also, 84.3% (n = 43) of these dyads could do this on a daily basis. Regarding infant feeding, 4.7% (n = 4) of the babies received exclusive breast milk, and almost 86% received both formula and breast milk. The most prevalent feeding method was the nasogastric tube (37.6%) and the use of a combination of bottle and direct breastfeeding (35.3%).

In this study, 14.1% and 23.5% of the women reported some depressive or anxious symptomatology during pregnancy, respectively. Also, 23% reported comorbid symptoms of depression and anxiety. Nevertheless, only 11% had a diagnosis of a depressive or anxiety disorder. During infant hospitalisation, 38.8% of the mothers reported EPDS scores above the cut-off score. Depressive and anxious symptoms during pregnancy (reported retrospectively) reported by the participants were significantly correlated with the EPDS score during the infant hospitalisation period (r = .32, p < .01).

The general stress perceived during the hospitalisation assessed by the NICU-PSS showed an average score of 4.1 (SD = 1.10). Almost 92% of the mothers' reported that having their baby hospitalised in the NICU was a stressful experience. The total score of this scale had a mean of 3.2 (SD = .72). According to the maternal reports, the 'Parental Role' was the most stressful area (M = 3.89, SD = .81) and the experiences assessed with

the 'Sight and Sounds' subscale appeared as the least stressful aspect (M = 2.83, SD = 1.04). The PSS: NICU total score was significantly and positively correlated with maternal EPDS scores during the hospitalisation, (r = .30, p < .01). Also, the subscale 'Appearance and Behaviour' had a positive, weak, and significant correlation with the EPDS score (r = .29, p < .01). This parental stress scale was also significantly correlated with moderate strength, with the mothers' educational level. Specifically, there was a negative correlation between the participants' education level and the PSS: NICU total score (r = −.26, p < .05) and with the 'Parental Role' subscale (r = −.32, p < .01).

The stress experienced by the mothers involved in the study was significantly related to the mother-infant interaction. We found a negative correlation between the total score of NEOVINC and the Subscale 'Appearance and Behaviour' (r = −.26, p < .05). The same pattern was observed between 'Mother reciprocity' and 'Baby Reciprocity' (assessed by the NEOVINC) with the Subscale 'Appearance and Behaviour' (r = −.29, p < .05; r = −.28, p < .05, respectively). 'Mother reciprocity' and 'Baby Reciprocity' were also moderate, and negatively correlated with the 'Parental Role' subscale (r = −.27, p < .05; r = −.30, p < .01, respectively) (See, Table 3).

When assessing the differences between groups adequate or small for gestational age, the Mann-Whitney U test revealed that mother-infant contact and interactions – as indicated by the NEOVINC total score, were less frequent in the dyads formed by babies who were small for gestational age (Md = 14.50, n = 24) compared to the dyads formed by infants who were 'adequate for gestational age' (Md = 17.00, n = 61), U = 473.00, z = −2.54, p = .01. Also, we observed a significant difference in terms of interaction during hospitalisation between the dyads who were able to do skin to skin in the NICU and those who were not able to do so, according to the Mann-Whitney U test. Dyads in the skin to skin group had higher total scores in the NEOVINC scale (Md = 18.00, n = 51), evidencing more interaction than the non-skin to skin dyads (Md = 14.00, n = 34), U = 457.50, z = −3.69, p = .00. The same test showed a significant difference in the stress perceived in the 'Parental Role' subscale of PSS: NICU when comparing the group that practiced skin to skin (Md = 4.20, n = 51) with the group that did not (Md = 3.70, n = 34), U = 619.50, z = −2.22, p = .03.

Finally, when dividing the group of participants according to their EPDS scores, the Mann-Whitney U test revealed a significant difference in the parental stress total score (PSS: NICU) in mothers with an EPDS score below the cut-off score (Md = 2.97, n = 52) and

Table 3. Correlation between variables.

	1	2	3	4	5	6	7	8	9	10	11
1. Mothers educational level											
2. Depressive or anxious symptoms during pregnancy	.08										
3. Depression or anxiety disorder during pregnancy	−.01	.29**									
4. EPDS	−.08	.32**	.30**								
5. PSS: NICU total score	−.26*	.31**	−.02	.30**							
6. Sub scale sight and sounds	−.09	.26*	−.01	.21	.19						
7. Sub scale looks and behaviour	−.19	.23*	.06	.29**	.49**	.27*					
8. Sub scale parental role	−.32**	.19	−.10	.16	.71**	.19	.49**				
9. Neovinc total score	−.07	−.03	−.16	−.06	−.12	.14	−.26*	−.17			
10.Neovinc mother reciprocity	−.03	−.05	−.18	−.08	−.21	.06	−.29*	−.27*	.94**		
11.Neovinc baby reciprocity	.02	−.01	−.16	−.02	−.18	.14	−.28*	−.30**	.96**	.96**	

Note. * = p < .05, ** = p < .01

the mothers with higher scores (*Md* = 3.40, n = 33), *U* = 611.50, z = −2.22, *p* = .03. Additionally, there was a significant difference in the 'Appearance and Behaviour' parental stress subscale between the mothers with a low risk of presenting with depression (i.e. an EPDS score below the 13-points cut-off score) (*Md* = 2.30, n = 52) and the mothers' with higher scores (*Md* = 3.50 n = 33), *U* = 603.00, z = −2.30, *p* = .02 (see table 3).

Discussion

The results of this study describe associations between the characteristics of moderate preterm babies, maternal emotional wellbeing, and the quality of mother-infant interactions in NICU settings. A very relevant aspect of the mother-infant relationship in this context is skin to skin contact, which allows direct contact between the parent and the newborn and has important benefits for the baby and the caregiver (Altimier & Phillips, 2016). In our study, only 34.1% of the dyads had immediate skin to skin after delivery and 60% were able to implement this strategy during the hospitalisation for less than 30 minutes on average each time. The dyads who use this strategy tend to interact more frequently and exhibit more synchrony and responsiveness with their infants (Mehler et al., 2020; Scatliffe et al., 2019). Skin to skin is considered a neuroprotective strategy, which is particularly relevant for preterm babies, who are more susceptible to present neurodevelopmental problems compared with their term-born peers. Facilitating an early, frequent, and sufficient duration of skin to skin (i.e. for at least 60 minutes) may be an effective intervention to reduce parental and infant stress in the NICU (Klawetter et al., 2019; Vittner et al., 2018). Moreover, this strategy favours parental proximity and sensibility, lactation, attachment, and improves physiological stability and neurological outcomes (Cho et al., 2016; Eliades, 2018; Feldman et al., 2003; Maastrup et al., 2021). Thus, its implementation is highly recommended in NICU settings.

In this study, exclusive breastfeeding or the use of human milk rate was low, despite a large amount of evidence supporting and promoting the use of human milk for preterm babies (Lechner & Vohr, 2017; Meier, 2019). Some of the barriers described for breastfeeding or using mothers' milk are the delayed initiation of lactation, the limited frequency of milk expression, the restrictions to the mothers' visits to the NICU, the lack of education and support during the hospitalisation (Gertz & DeFranco, 2019; Maastrup et al., 2014; Wang et al., 2019). An improvement in this area must involve not only the mothers but a broader spectrum of actors, because breastfeeding is a collective responsibility and there are different determinants that can affect breastfeeding decisions and behaviours. Some of these determinants are related to individual factors such as the mother and infant attitudes and their relationship, others are associated with the socio-cultural and market context, and also there are some factors that correspond to the health system, the family and community, and the workplace (Rollins et al., 2016).

Breastfeeding also depends on the infant's health status and his/her physiological and neurodevelopmental maturation (Ludwig, 2007). Dosani and colleagues (2016) described that mothers find breastfeeding challenging because of the prematurity of their newborn. This could be related to the complex demands of oral motor skills of this activity (i.e. sucking, swallowing and breathing; Santos et al., 2008). Also, mothers of preterm infants usually have to express milk and use tube feeding or bottle to meet the nutritional needs of their baby. As Wang and his colleagues stated (Wang et al., 2019), many mothers look

forward to full breast-feed their babies because of the difficulties that implies the combination of breastfeeding, pumping milk and then giving that expressed milk to the baby. The experience of direct breastfeeding has a crucial role in preparing these mothers for breastfeeding after discharge and could also have a positive effect on the breastfeeding duration (Briere et al., 2016).

Women in this study showed high levels of depressive symptomatology and high levels of stress, which are consistent with results from previous studies supporting the association between preterm birth and maternal postpartum depression (Alkozei et al., 2014; De Paula Eduardo et al., 2019; Trumello et al., 2018). Even though this relation in this study was established for mothers of moderate preterm babies, other researchers have described that in the case of more serious preterm conditions, their parents are at higher risk for postpartum depression (Genova et al., 2022). High levels of maternal stress were related to the participants' parental role; these results could be related to mothers' sense of powerlessness and helplessness in the NICU. This source of stress can negatively impact maternal mental health due to the increase in anxiety and depressive symptoms, frustration, and guilt (Müller Nix & Ansermet, 2009). Also, high symptoms of depression were positively associated with higher levels of stress in the 'Appearance and Behaviour' of the PSS: NICU subscale, this could be explained by the impact that causes the external characteristics of their preterm newborn (Ionio et al., 2016). Alternatively, mothers who present with symptoms of depression may be more likely to have a negative perception of their infant's appearance during hospitalisation.

Higher levels of stress related to the physical appearance and the behaviours of the babies were also related to the interaction between the mother and the baby. In our study, stressed mothers tended to interact less with their infants and showed less reciprocity in their interactions. This may have a long-term impact on the quality of interactions in the dyad (Gerstein et al., 2015). The stress experienced by the mothers in the NICU was also associated with their symptoms of depression. A possible, bidirectional relationship between maternal depression and anxiety may enhance the negative aspects of having a hospitalised infant; similarly, this experience in the NICU may negatively impact maternal depressive symptomatology. Also, being small for gestational age may be considered as a risk factor for maternal stress and for difficulties in the relation between the members of the dyad. Kawafha (2018) shows that mothers of small babies feel more stress in relation to the parental role compared to mothers of babies adequate for gestational age. This may be associated with small infants being more fragile than term infants (Kawafha, 2018), an aspect which should be considered when interacting with parents during infant hospitalisation in the NICU.

One of the strengths of this study refers to the focus on moderate preterm babies during their hospitalisation, a population which is often understudied due to a larger interest on extreme preterm infants (Gouyon et al., 2012). Additionally, we were able to assess the interaction between the mothers and their babies during hospitalisation using an observational scale, which contributes to develop a better understanding of the mother -infant relationship in these dyads.

Nevertheless, there are some limitations, including the sample size and the characteristics of the participants; whose voluntary participation may have biased the sample through the self-selection of mothers with fewer mental health difficulties. Also, parental stress and depressive symptomatology were assessed using self-report instruments

(Zarghami et al., 2020). An additional limitation refers to the use of the Parental Stress Scale for Neonatal Intensive Care Units (PSS: NICU) and the observational scale (i.e. N-EOV-INC), which have not been validated to be used in Chilean samples. Future research could incorporate the use of different strategies to assess the mother's mental health and support the validation of existing instruments to study preterm infants and their families.

From a different perspective, this study provides descriptive findings regarding maternal emotional wellbeing, moderate preterm infants and mother-infant interactions during hospitalisation. However, it does not explore underlying mechanisms involved in these phenomena. Future studies could further develop this in preterm infant populations and could involve other significant figures, such as fathers or partners.

Despite these limitations, our results contribute to a better understanding of moderate preterm infants' characteristics and their mothers' stress levels and depressive symptomatology, and how this impacts the mother-infant interaction during the hospitalisation. These findings could support the implementation of strategies and the development of protocols that promote maternal and infant wellbeing in NICU settings. These interventions could favour parental mental health and sensitive parenting behaviours, as the programmes based in Developmental and Family Centered approaches (Neonatal Behavioural Observations, Newborn Individualised Developmental Care Programmes (Lean et al., 2018).

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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