RESEARCH ARTICLE

WILEY

Postpartum during COVID-19 pandemic: Portuguese mothers' mental health, mindful parenting, and mother–infant bonding

Daniela V. Fernandes ⬤ | Maria C. Canavarro ⬤ | Helena Moreira ⬤

Centre for Research in Neuropsychology and Cognitive Behavioural Intervention, Faculty of Psychology and Educational Sciences, University of Coimbra, Coimbra, Portugal

Correspondence

Daniela V. Fernandes, Centre for Research in Neuropsychology and Cognitive Behavioural Intervention, Faculty of Psychology and Educational Sciences, University of Coimbra, Rua do Colégio Novo, 3030-115, Coimbra, Portugal.
Email: daniela_fvf@hotmail.com

Abstract

Background: Millions of people worldwide have been diagnosed with coronavirus disease 2019 (COVID-19), which has impacted maternal mental health and mother–infant relationships during the postpartum period.

Objectives: To explore how mothers' anxious and depressive symptoms, parenting stress, mindful parenting, and mother–infant bonding vary as a function of the moment of the baby's birth (pre-COVID-19 or post-COVID-19) and to examine the contribution of those variables to mother–infant bonding.

Methods: The sample was recruited online and comprises 567 mothers (18–46 years) with an infant aged between 0 and 12 months old.

Results: Approximately 27.5% of the mothers presented clinically significant levels of anxious and depressive symptoms. Mothers who gave birth during the COVID-19 pandemic presented lower levels of Emotional Awareness of the Child and a more impaired mother–infant bonding than mothers who gave birth before the pandemic started. Approximately 49% of the mother–infant bonding variance was explained by parenting stress and by several dimensions of mindful parenting.

Conclusion: Our findings provide important insights into the impact of COVID-19 on maternal mental health and parenting.

KEYWORDS
COVID-19, mental health, mindful parenting, mother–infant bonding, postpartum

1 | INTRODUCTION

Since December 2019, a novel coronavirus (severe acute respiratory syndrome coronavirus 2), which causes coronavirus disease 2019 (COVID-19), has infected millions of people worldwide. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic. Given its high level of transmission between humans, it was necessary to adopt measures to contain the spread of the disease. In Portugal, a State of National Emergency was declared on March 18 that resulted in a national lockdown, home confinement, telework, and temporary closure of nonessential businesses and schools (Directorate-General of Health [DGS], 2020a).

The COVID-19 pandemic has affected people's lives at different levels, beginning in the first hours and days after birth (Stuebe, 2020), which makes postpartum mothers a particularly vulnerable group (Thapa et al., 2020). In Portugal, as in the rest of the world, several adaptations to postpartum care have been made to better deal with pandemic demands. When mothers did not have suspicion or confirmation of COVID-19 infection, the birth must take place in the usual way, with the reinforcement of infection prevention and control measures, which extend to the postpartum period. When mothers were suspected or confirmed to have COVID-19, infection prevention and control measures should also be adopted, but there were no well-defined guidelines about mother–infant contact after birth (DGS, 2020a). The inconsistent guidance and ethical challenges for clinical teams trying to balance parental rights with the mitigation of risks to the infant resulted in practice variation and may have contributed to higher levels of stress for mothers and families (Teti et al., 2020).

Postpartum mothers may have concerns regarding their own health and risk of infection, as well as regarding the health of their infants and loved ones (Matvienko-Sikar et al., 2020). These concerns were particularly intensified by preventive measures, such as quarantine, physical distancing, home isolation, remote consultations with healthcare professionals, and the impossibility of obtaining the expected level of support and care during the postpartum period (Thapa et al., 2020). Therefore, this pandemic context during the postpartum period seems to have potentiated mental health difficulties, leading to the development of anxious and depressive symptoms (Davenport et al., 2020) and parenting stress (Coyne et al., 2020) in mothers. Recently, a few studies have shown the negative impact of COVID-19 and quarantine measures on maternal mental health and mother–infant relationships. For instance, a study conducted with postpartum mothers showed that mothers who gave birth during a period of COVID-19 quarantine presented higher levels of depressive symptoms than mothers in a control group who gave birth during the same period the previous year (Zanardo et al., 2020). Likewise, a study that compared the results of mental screening of postpartum mothers during the COVID-19 pandemic and mothers during the same period last year concluded that mother–infant bonding was worse one month after birth among mothers who gave birth during the COVID-19 pandemic (Suzuki, 2020).

Although there is some evidence that the COVID-19 pandemic has a negative impact on maternal mental health, its impact on parenting behaviors and on the mother–infant relationship during the postpartum period was scarcely investigated. Extensive research suggests that maternal mental health problems are associated with short- and long-term risks for the mother–infant relationship, particularly for the establishment of mother–infant bonding (the emotional connectedness between mothers and infants; Nolvi et al., 2016) (e.g., Fallon et al., 2019). For instance, a study conducted by Tolja et al. (2020) showed that during the postpartum period, anxious and depressive symptoms were associated with poorer mother–infant bonding. Similarly, a study conducted by Reck et al. (2016) showed that higher levels of parenting stress were associated with lower levels of mother–infant bonding. Moreover, other studies have also suggested that mental health problems, such as anxious and depressive symptoms and parenting stress, may make it more difficult for mothers to adopt a positive and mindful parenting approach (Fernandes et al., 2021).

Mindful parenting can be defined as a more accepting, emotionally attuned, and compassionate way of parenting (Coatsworth et al., 2018). It is characterized by parenting practices that promote responsive and sensitive care to the child's needs (Medeiros et al., 2016), through the promotion of mindful parenting skills, such as *listening with full attention to the child, emotional awareness of the child, self-regulation in the parenting relationship, a*

non-judgmental acceptance of parental functioning, and *compassion for the child* (e.g., Moreira & Canavarro, 2017). Several studies conducted with parents of children and adolescents have shown that maternal psychopathological symptoms, as well as parenting stress, are associated with lower levels of mindful parenting (e.g., Moreira et al., 2019). Although the scarcity of research during the postpartum period, a few studies have shown that mindful parenting training may reduce mothers' psychopathological symptoms and may promote a more positive mother–infant relationship through the promotion of mindful parenting skills (e.g., Potharst et al., 2017).

To our knowledge, no studies have focused on maternal mental health, parenting styles, and behaviors or the mother–infant relationship of postpartum mothers during the COVID-19 pandemic. Therefore, the present study aimed (i) to explore if mothers' mental health (anxious symptoms, depressive symptoms, and parenting stress), mindful parenting, and mother–infant bonding vary as a function of the moment of the baby's birth (before the pandemic—pre-COVID-19 group or during the pandemic—post-COVID-19 group); and (ii) to examine the contribution of COVID-19-related variables, maternal mental health, and mindful parenting to the explanation of the mother–infant bonding variance.

2 | METHODS

2.1 | Participants

The sample included 567 Portuguese mothers of babies aged between zero and 12 months. Most mothers were living in a nuclear family type (i.e., a family with two parents and their children) and had completed higher education. About 414 mothers (73%) gave birth before the pandemic (pre-COVID-19 group) and 153 mothers (27%) gave birth during the pandemic (post-COVID-19 group). The complete sociodemographic and clinical information, according the two groups of the mothers and their babies are presented in Table 1.

The COVID-19-related information is presented as a function of the moment of the baby's birth (i.e., pre- or post-COVID-19) in Table 2.

2.2 | Procedure

The participants were recruited online, between April 30, 2020 and May 21, 2020, which corresponds to a period of major restrictions in Portugal (State of National Emergency and the first phase of the plan for lifting lockdown measures). The sample was recruited through a data collection website (LimeSurvey®). The study was shared through email, unpaid cross-posting, and paid boosting campaigns. Several advertisements were posted on a Facebook page about parenting and mental health that was previously created by the research team, as well as on social networks. The advertisements explained the main goals of the study and presented the inclusion criteria and a web link to the survey hosted in LimeSurvey®. The participants who clicked on the link were then given information about the study, namely, a description of the objectives, the inclusion criteria, and the ethical statement of the study. The participants were informed that their participation was voluntary and anonymous, and that no identifying information would be collected. Only those who agreed to the study conditions and who provided their informed consent completed the assessment protocol. No compensation was given to participants. The participants were eligible to participate in the study if they fulfilled the following inclusion criteria: (i) being Portuguese; (ii) being over 18 years old; and (iii) having at least one child between zero and 12 months old.

This study refers to the first moment of assessment of a longitudinal study conducted to examine the impact of the COVID-19 pandemic on maternal mental health, mindful parenting, and mother–infant bonding during the postpartum period. Of the 917 participants who completed at least one questionnaire in the first assessment moment, 20 mothers were excluded because of their nationality (they were not Portuguese), 295 mothers were

TABLE 1 Sociodemographic and clinical information of the sample

	Pre-COVID-19 group (n = 414)	Post-COVID-19 group (n = 153)	Comparison analyses t/χ^2	d/Cramer's V
Mothers' age, years, M (SD); range	32.95 (4.85); 19–46	33.02 (5.61); 18–45	−0.13	0.010
Mothers' marital status n (%)			7.08*	0.112
Living with a partner	356 (86%)	144 (94.1%)		
Not living with a partner	58 (14%)	9 (5.9%)		
Mothers' type of family n (%)			3.98	0.084
Single parent	16 (3.9%)	2 (1.3%)		
Nuclear	318 (76.8%)	126 (82.4%)		
Reconstituted	3 (0.7%)	2 (1.3%)		
Extended	77 (18.6%)	23 (15%)		
Mothers' education n (%)			0.64	0.034
Basic or secondary education	186 (44.9%)	63 (41.2%)		
Higher education	228 (55.1%)	90 (58.8%)		
Mothers' current employment status n (%)	Missing: 8		153.69***	0.524
Working in the workplace	53 (13.1%)	-		
Working from home	49 (12.1%)	-		
Not working, helping children after closure of schools	37 (9.1%)	1 (0.7%)		
Laid off	34 (8.4%)	-		
Unemployed, housewives, full-time mothers, students	72 (17.7%)	2 (1.3%)		
Maternity leave	161 (39.7%)	150 (98%)		
Mothers' household monthly income n (%)			4.99*	0.094
Less than 2000€	329 (79.5%)	108 (70.6%)		
2000€ or above	85 (20.5%)	45 (29.4%)		
Mothers' area of residence n (%)			0.61	0.033
Urban	278 (67.1%)	108 (70.6%)		
Rural	136 (32.9%)	45 (29.4%)		
Babies' age (months) M (SD); range	6.23 (2.81); 2–12	1.34 (0.75); 0–4	21.22***	2.38
Babies' sex n (%)			0.40	0.027
Girls	218 (52.7%)	76 (49.7%)		
Boys	196 (47.3%)	77 (50.3%)		
Mothers' parity n (%)			1.71	0.055
Primiparous	263 (63.5%)	88 (57.5%)		
Multiparous	151 (36.5%)	65 (42.5%)		

TABLE 1 (Continued)

	Pre-COVID-19 group (n = 414)	Post-COVID-19 group (n = 153)	Comparison analyses t/χ²	d/Cramer's V
Mothers' current psychological and/or psychiatric problem n (%)			0.03	0.007
Yes	26 (6.3%)	9 (5.9%)		
No	388 (93.7%)	144 (94.1%)		
Mothers' current psychological treatment n (%)			2.49	0.066
Yes	28 (6.8%)	5 (3.3%)		
No	386 (93.2%)	148 (96.7%)		

Note: The Portuguese minimum wage in 2019 was 600 EUR (721.50 USD).

Abbreviation: COVID-19, coronavirus disease 2019.

*$p < 0.05$.

***$p < 0.001$.

TABLE 2 COVID-19-related information as a function of the moment of the baby's birth

	Pre-COVID-19 group (n = 414)	Post-COVID-19 group (n = 153)	Comparison analyses χ²	Cramer's V
COVID-19-related information				
Accompaniment during birth n (%)			100.12***	0.420
Yes	358 (86.5%)	70 (45.8%)		
No	56 (13.5%)	83 (54.2%)		
To be with the baby after birth n (%)			0.13	0.015
Yes	392 (94.7%)	146 (95.4%)		
No	22 (5.3%)	7 (4.6%)		
Adoption of extra measures in mother–infant's interaction n (%)			102.99***,†	0.426
Yes (e.g., use of masks, no breastfeeding, no visits)	3 (0.7%)	40 (26.1%)		
No	411 (99.3%)	113 (73.9%)		
Increased perceived postpartum difficulties			5.41*	0.098
Yes	198 (47.8%)	90 (58.8%)		
No	216 (52.2%)	63 (41.2%)		
Increased concerns about the baby's care			0.24	0.020
Yes	348 (84.1%)	126 (82.4%)		
No	66 (15.9%)	27 (17.6%)		

Abbreviation: COVID-19, coronavirus disease 2019.

*$p < 0.05$.

***$p < 0.001$.

†Fisher's exact test.

excluded because one or more of the study questionnaires were not completed, seven mothers were excluded because their babies were more than 12 months old, and 28 men were excluded due to their low representation in the survey.

2.3 | Measures

2.3.1 | Sociodemographic, clinical and COVID-19-related information

A self-reported questionnaire was specifically developed for this study by the research team to assess sociodemographic (e.g., participants' age), clinical (e.g., current psychological and/or psychiatric problem) and COVID-19-related information of mothers. To assess COVID-19-related information, questions were developed based on DGS national guidelines (DGS, 2020a, 2020b). Participants answered the following questions: (1) the moment of the baby's birth ("Was your baby born during the current pandemic?" [yes or no]); (2) if the mother was accompanied during birth ("Were you accompanied during birth?" [yes or no]); (3) if mother was able to be with the baby after birth ("Were you with your baby after birth?" [yes or no]); (4) the adoption of extra measures (e.g., use of masks, no breastfeeding, and no visits) in the mother–infant interaction in the immediate postpartum period ("Were extra measures adopted in regard to the mother–infant interaction in the immediate postpartum period?" [yes or no]); (5) if the mother perceived increased postpartum difficulties due the state of emergency implementation ("Do you perceive more postpartum difficulties (e.g., difficulties in your marital relationship, difficulties in familiar relationships, difficulties in providing baby's care, difficulties dealing with emotions) due the implementation of the state of emergency?" [yes or no]); and (6) if the mother felt increased concerns about the baby's care due the state of emergency ("Do you feel more concern about the baby's care due the implementation of the state of emergency?" [yes or no]).

2.3.2 | Anxious and depressive symptomatology

The Portuguese version of the Hospital Anxiety and Depression Scale (HADS; Pais-Ribeiro et al., 2007) was used to assess levels of anxious and depressive symptomatology in the previous week. This questionnaire contains 14 items (e.g., "I feel tense or wound up"; "I still enjoy the things I used to enjoy") distributed to assess two factors (anxiety and depression) and uses a 4-point response scale, ranging from 0 (not at all/only occasionally) to 3 (most of the time/a great deal of the time). The factor scores are the sum of the items, with higher scores indicating higher levels of symptomatology. Scores between 0 and 7 are considered "normal"; between 8 and 10, "mild"; between 11 and 14, "moderate"; and between 15 and 21, "severe". According to Snaith (2003), scores of 11 or higher indicate the possible presence (i.e., "caseness") of a mood disorder. The Portuguese version of HADS has robust psychometric properties, including adequate reliability and construct validity (Pais-Ribeiro et al., 2007). In this sample, Cronbach's alpha coefficients were 0.85 for anxiety ($M_{(no\ disease)} = 7.81$) and 0.80 for depression ($M_{(no\ disease)} = 3.22$).

2.3.3 | Parenting stress

The Portuguese version of the Parental Stress Scale (PSS; Mixão et al., 2010) was used to assess parenting stress. The questionnaire has 18 items (e.g., "Caring for my child(ren) sometimes takes more time and energy than I have to give") answered on a 5-point response scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total score is calculated as the sum of the items, with higher scores indicating higher parenting stress. The Portuguese

version of PSS presents adequate psychometric properties, including adequate reliability and construct validity (Mixão et al., 2010). In this sample, Cronbach's alpha coefficient was 0.85 (M = 31.76; SD = 6.74).

2.3.4 | Mindful parenting

To assess mindful parenting, the Portuguese Interpersonal Mindfulness in Parenting Scale (IM-P—Infant version; in press et al., in press) was used. The IM-P—Infant version contains 28 items scored on a 5-point response scale, ranging from 1 (never true) to 5 (always true). The items are distributed across five subscales: (1) Listening with Full Attention (LFA) (e.g., "I find myself paying little attention to my baby because I am busy doing or thinking about something else at the same time"); (2) Emotional Awareness of the Child (EAC) (e.g., "It is hard for me tell what my baby is feeling"); (3) Self-Regulation in Parenting (SR) (e.g., "If I am upset with my baby, I notice how I am feeling before I take action"); (4) Non-Judgmental Acceptance of Parental Functioning (NJAPF) (e.g., "I tend to criticize myself for not being the kind of parent I want to be"); and (5) Compassion for the Child (CC) (e.g., "I am kind to my baby when he/she is tearful, restless or upset with something"). The subscale scores are the sum of the items, and higher scores indicate higher levels of the mindful parenting dimensions. The Portuguese version of IM-P—Infant version has shown construct validity and reliability (Caiado et al., in press). In this sample, Cronbach's alpha coefficients were 0.84 for the total scale (M = 116.34; SD = 12.75), 0.86 for LFA (M = 20.81; SD = 3.01), 0.67 for EAC (M = 11.48; SD = 1.94), 0.64 for SR (M = 30.18; SD = 4.57), 0.78 for NJAPF (M = 24.67; SD = 4.90), and 0.76 for CC (M = 22.12; SD = 2.36).

2.3.5 | Mother–infant bonding

To assess mother–infant bonding, the Portuguese version of Postpartum Bonding Questionnaire (PBQ; Nazaré et al., 2012) was used. The PBQ is a self-report questionnaire designed to provide an early indication of mother–infant bonding disorders. It has 12 items (e.g., "I feel close to my baby") to be rated on a 5-point response scale, between 0 (never) and 5 (always). The Portuguese version of PBQ has shown good construct, convergent, and discriminant validity (Nazaré et al., 2012). The total score is calculated as the sum of the items, with higher scores indicating a more impaired mother–infant bonding. In the present sample, the Cronbach's alpha coefficient was 0.74 (M = 3.70; SD = 3.58).

2.4 | Data analyses

Data analyses were conducted using the Statistical Package for the Social Sciences (IBM SPSS, version 25.0). Descriptive statistics were computed for all sociodemographic and study variables. To compare groups [i.e., pre- or post-COVID-19 group]) on several variables, we used χ^2 tests (to compare categorical variables) and t-tests (to compare continuous variables). Fisher's exact test was reported when the frequencies in each cell was lower than five. Cohen's d (small: $d \geq 0.20$; medium: $d \geq 0.50$; large: $d \geq 0.80$) and Cramer's V were used as effect-size measures.

First, differences in anxious symptoms, depressive symptoms, parenting stress, mindful parenting dimensions, and mother–infant bonding were analyzed as a function of the moment of the baby's birth (i.e., pre- or post-COVID-19 group) through t-tests. Second, point-biserial correlations (for categorial variables) and Pearson correlations (for continuous variables) were computed. To analyze the contribution of COVID-19-related variables, maternal mental health, and mindful parenting dimensions to the explanation of the mother–infant bonding variance, hierarchical multiple regression analyses (enter method) were performed. Before conducting the hierarchical multiple regression, the relevant assumptions were verified through both the tolerance and Variance Inflation

Factor (VIF) statistics and Durbin–Watson test. The effect sizes of the main effects were based on R^2 values (small effects: $R^2 \geq 0.02$; medium effects: $R^2 \geq 0.13$; and large effects: $R^2 \geq 0.26$) (Cohen, 1988). For all the described analyses, a p value of 0.05 was set as the significance cut-off point.

3 | RESULTS

3.1 | Maternal mental health, mindful parenting, and mother–infant bonding: Comparative analyses as a function of the moment of the baby's birth

Most mothers reported normal or mild levels of anxious and/or depressive symptomatology ($n = 411$, 72.5%) and 27.5% ($n = 156$) reported clinically significant levels of those symptoms (i.e., scored ≥ 11 on one or both of the HADS subscales).

As presented in Table 3, mothers whose baby was born during the pandemic (post-COVID-19 group) presented lower levels of Emotional Awareness of Child and a more impaired bonding with the infant than those whose baby was born before the pandemic (pre-COVID-19 group).

3.2 | Correlations between variables

Before proceeding to the hierarchical regression, point-biserial correlations, and Pearson correlations between study variables and mother–infant bonding were analyzed. Impaired mother–infant bonding was positively and significantly associated with more perceived postpartum difficulties due to the implementation of the state of emergency (0 = no; 1 = yes; $r_{pb} = 0.14$, $p < 0.001$) and the moment of the baby's birth (0 = pre-COVID-19; 1 = post-COVID-19; $r_{pb} = 0.09$, $p < 0.005$). Moreover, impaired mother–infant bonding was positively and significantly associated with anxious symptoms ($r = 0.28$, $p < 0.001$), depressive symptoms ($r = 0.36$, $p < 0.001$), parenting stress ($r = 0.66$, $p < 0.001$), and negatively and significantly with all dimensions of mindful parenting, namely, Listening

TABLE 3 Comparative analyses of mothers' mental health, mindful parenting and bonding as a function of the moment of the baby's birth

	Pre-COVID-19 group (n = 414) M (SD)	Post-COVID-19 group (n = 153) M (SD)	Comparison analyses		
			t	p	d
Anxious symptoms	7.83 (4.22)	7.10 (3.97)	1.85	0.064	0.18
Depressive symptoms	6.03 (3.86)	5.50 (3.76)	1.45	0.148	0.14
Parenting stress	35.96 (8.38)	37.40 (9.03)	−1.77	0.076	0.17
Listening with full attention	21.10 (2.93)	21.20 (3.19)	−0.34	0.733	0.03
Emotional awareness of the child	11.83 (1.94)	11.05 (2.06)	4.18	<0.001	0.39
Self-regulation in parenting	30.76 (4.13)	30.67 (4.00)	0.23	0.821	0.02
Non-judgmental acceptance of parental Functioning	24.40 (4.82)	24.07 (5.23)	0.71	0.481	0.07
Compassion for the child	22.36 (2.26)	22.05 (2.61)	1.42	0.156	0.13
Mother–infant bonding	4.13 (3.51)	4.88 (4.36)	−2.13	0.034	0.19

Abbreviation: COVID-19, coronavirus disease 2019.

With Full Attention ($r = -0.48$, $p < 0.001$), Emotional Awareness of the Child ($r = -0.38$, $p < 0.001$), Self-Regulation in Parenting ($r = -0.48$, $p < 0.001$), Non-Judgmental Acceptance of Parental Functioning ($r = -0.36$, $p < 0.001$), and Compassion for the Child ($r = -0.55$, $p < 0.001$).

3.3 | The contributions of COVID-19-related information, maternal mental health, and mindful parenting to the explanation of mother–infant bonding

Table 4 presents the regression model predicting mother-infant bonding. First, step 1 of the hierarchical multiple regression, which included the COVID-19-related information that was significantly correlated with mother–infant bonding (increased perceived postpartum difficulties due to the state of emergency and the moment of the baby's

TABLE 4 Hierarchical multiple regression of mother–infant bonding regarding COVID-19-related information, maternal mental health and mindful parenting

| Step and predictor variables | Mother–infant bonding | | | |
	b	SE b	Std. β	p
Step 1 – COVID-19-related information	$R^2 = 0.024\|F_{(2,564)} = 6.94$, $p = 0.001$			
Constant	3.67	0.24	-	0.000
Increased perceived postpartum difficulties	0.96	0.32	0.13	0.002
Moment of the baby's birth	0.65	0.36	0.08	0.067
Step 2 – Maternal mental health	$R^2 = 0.433\|F_{(5,561)} = 85.62$, $p < 0.001$			
Constant	−6.12	0.54	-	0.000
Increased perceived postpartum difficulties	−0.07	0.26	−0.01	0.791
Moment of the baby's birth	0.33	0.28	0.04	0.230
Anxious symptoms	−0.04	0.04	−0.05	0.300
Depressive symptoms	0.03	0.05	0.03	0.526
Parenting stress	0.29	0.02	0.66	<0.001
Step 3 – Mindful parenting	$R^2 = 0.492\|F_{(10,556)} = 53.95$, $p < 0.001$			
Constant	7.64	1.92	-	0.000
Increased perceived postpartum difficulties	−0.01	0.25	−0.00	0.956
Moment of the baby's birth	0.29	0.27	0.03	0.284
Anxious symptoms	−0.05	0.04	−0.06	0.204
Depressive symptoms	0.03	0.05	0.03	0.525
Parenting stress	0.21	0.02	0.49	<.001
Listening with Full Attention	−0.13	0.05	−0.11	0.006
Emotional Awareness of the Child	−0.13	0.07	−0.07	0.063
Self-Regulation in Parenting	−0.12	0.04	−0.13	0.002
Non-Judgmental Acceptance of Parental Functioning	−0.00	0.03	−0.01	0.909
Compassion for the Child	−0.14	0.07	−0.09	0.039

Abbreviation: COVID-19, coronavirus disease 2019.

birth), was significant and accounted for 2.4% of the variance in mother-infant bonding ($F_{(2,564)}$ = 6.94, p = 0.001). In this step, only increased perceived postpartum difficulties were associated with a more impaired mother–infant bonding (β = 0.13, p = 0.001). Second, step 2, in which maternal mental health variables were entered, was significant and accounted for 43.3% of the variance in mother-infant bonding ($F_{(5,561)}$ = 85.62, p < 0.001). The results showed a significant regression coefficient for parenting stress (β = 0.66, p < 0.001), suggesting that higher levels of parenting stress were associated with a more impaired mother–infant bonding. Finally, step 3, in which mindful parenting dimensions were entered, was significant and accounted for 49.2% of the variance in mother-infant bonding ($F_{(10,561)}$ = 53.95, p < 0.001). The results showed significant regression coefficients for parenting stress (β = 0.49, p < 0.001), Listening with Full Attention (β = −0.11, p = 0.006), Self-Regulation in Parenting (β = −0.13, p = 0.002), and Compassion for the Child (β = −0.09, p = 0.039), suggesting that higher levels of parenting stress and lower levels of these mindful parenting dimensions were associated with a more impaired mother-infant bonding (see Table 4).

4 | DISCUSSION

In the present study, 27.5% of mothers presented clinically significant anxious and depressive symptomatology levels. This result is in accordance with other studies, showing the adverse effect of the COVID-19 pandemic on maternal mental health during the postpartum period (e.g., Ceulemans et al., 2020) and an increase in maternal anxiety and depression in comparison with the levels in the period before the COVID-19 pandemic. For instance, in a study conducted among Portuguese mothers in the pre-COVID-19 period, 22.1% of postpartum mothers presented clinically significant anxious and depressive symptoms (e.g., Fernandes et al., 2021).

Significant differences were found in mindful parenting and in the mother–infant bonding as a function of the moment of baby's birth. Specifically, mothers who gave birth during the pandemic presented lower levels of Emotional Awareness of the Child and a more impaired bonding with their infant than those who gave birth before the pandemic. In fact, it is possible that mindful parenting is responsive to contextual factors, as a pandemic context, and shows considerable stability over time (Coatsworth et al., 2018). This may potentially explain why mothers who gave birth before or during the pandemic context presented similar results in several dimensions of mindful parenting. However, Emotional Awareness of the Child seems to be lower in mothers who gave birth during the pandemic context. During this period, mothers may have been more focused on fear and danger about the new unknown disease and its consequences (Centers for Disease Control and Prevention, 2020), and this may led them less able to decenter from their own emotions and focus their attention on the baby's emotions, specifically. Also, babies who were born during the pandemic are significantly younger than those who were born before the pandemic. This may specifically difficult mothers' ability to recognize and identify baby's emotions, given the most challenging character of the first months of the postpartum period (Kristensen et al., 2018) as well as the shorter time they have had interacting with their babies, than mothers who gave birth before the pandemic. Moreover, the pandemic context may have brought a sense of feeling deceived of the joys of maternity and a sense of feeling robbed of the little pleasures of the perinatal period, accompanied by a sense of guilt and loss (Das, 2020) which may have had a negative effect on mother's availability to emotionally bond with their infant.

This study also identified several predictors of mother-infant bonding, suggesting that higher levels of parenting stress and lower levels of some mindful parenting dimensions (Listening with Full Attention, Self-Regulation in Parenting, and Compassion for the Child) were associated with a more impaired mother–infant bonding. Those variables seem to be more important in explaining bonding than psychopathological symptoms and contextual variables, such as COVID-19-related information. Previous research has shown that mothers who presented higher levels of parenting stress tend to react automatically in parenting situations (Bögels & Restifo, 2014), and their threat system may be activated more often (Siegel & Hartzell, 2013). This may leave parents more reactive and less sensitive and warm during mother–infant interactions and thus result in a more impaired emotional bond with the

infant. Furthermore, our results are consistent with other studies which showed that mindful parenting helps parents become more attentive toward their children, be aware of what they communicate (Potharst et al., 2019) and be fully present during interactions (Duncan et al., 2009). Therefore, this may have repercussions on parents' emotional availability (Potharst et al., 2019) and consequently on mother–infant bonding. Likewise, mindful parenting allows parents to become aware of their parenting stress, accept the situation and feelings, and regulate them (Potharst et al., 2019). Studies have shown that the mother's ability to contain her own internal experience allows for a more attuned response to the infant, therefore promoting mother–infant bonding (e.g., Pickard et al., 2017). In the same way, when mothers are kind, sensitive and responsive to the infant's needs, they have their soothing system stimulated (Cree, 2010), and they may be more available to give to the baby love and attention that will facilitate the establishment of mother–infant bonding (Wada et al., 2020).

5 | LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has some limitations that should be mentioned. First, this was a cross-sectional study, and therefore, causal relationships cannot be inferred. Future longitudinal studies are needed to better understand the directionality and associations between the variables explored in the current study. Second, the sample was collected online, which could lead to self-selection bias since people who participated in this study were likely to be more motivated and interested in the subject than those in the general population. Third, only self-report measures were used, which can compromise the validity of the results once participants may be influenced by social desirability and not reliably report their inner states. Forth, the sample was entirely composed of mothers, which limits the generalization of these results to fathers. Fifth, most of the mothers in this study were married or living with a partner, had completed higher education, and lived in urban areas, which may compromise the generalization of the results to mothers with different sociodemographic characteristics. Future studies should use a sample with more sociodemographic diversity.

Despite these limitations, this study provides innovative knowledge by suggesting that mother–infant bonding can be explained by parenting stress and several dimensions of mindful parenting. These results emphasize the need to identify mothers who present a higher risk of developing parenting stress, for instance, by screening these symptoms in healthcare settings and referring mothers who could benefit from psychological care (Yanyu et al., 2020). In addition, understanding the variables that may contribute to mother–infant bonding, during the postpartum period, may be useful in informing future psychological interventions in this context. An intervention that could help mothers to manage parenting stress and to promote mindful parenting skills might be especially useful to promote mother–infant bonding during the postpartum period (e.g., Potharst et al., 2019). In a pandemic context, internet-based screening tools and web-based psychological support and therapeutic interventions may be particularly relevant (Thapa et al., 2020). Future clinical studies should further explore this possibility and are needed to understand how to promote mother–infant bonding, during the postpartum period.

CONFLICT OF INTERESTS
The authors declare that there are no conflict of interests.

PEER REVIEW
The peer review history for this article isavailable at https://publons.com/publon/10.1002/jclp.23130

DATA AVAILABILITY STATEMENT

Data available on request due to privacy/ethical restrictions The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra approved the study.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

ORCID

Daniela V. Fernandes 🔟 http://orcid.org/0000-0002-8947-5138
Maria C. Canavarro 🔟 http://orcid.org/0000-0002-5083-7322
Helena Moreira 🔟 http://orcid.org/0000-0002-1487-0539

REFERENCES

Bögels, S., & Restifo, K. (2014). *Mindful parenting: A guide for mental health practitioners*. W.W. Norton.

Caiado, B., Fernandes, D. V., Moreira, H., & Canavarro, M. C., & (in press). The Interpersonal Mindfulness in Parenting Scale - Infant Version: Psychometric properties and factor structure in a sample of portuguese mothers in the postpartum period. *Psychologica*. Under submission.

Centers for Disease Control and Prevention. (2020). Coping with stress. Retrieved july, 2020 from https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/managing-stress-anxiety.html

Ceulemans, M., Hompes, T., & Foulon, V. (2020). Mental health status of pregnant and breastfeeding women during the COVID-19 pandemic: A call for action. *International Journal of Gynecology & Obstetrics, 151*, 146–147. https://doi.org/10.1002/ijgo.13295

Coatsworth, J., Timpe, Z., Nix, R. L., Duncan, L. G., & Greenberg, M. T. (2018). Changes in mindful parenting: Associations with changes in parenting, parent-youth relationship quality, and youth behavior. *Journal of the Society for Social Work and Research, 9*(4), 511–529. https://doi.org/10.1086/701148

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

Coyne, L. W., Gould, E. R., Grimaldi, M., Wilson, K. G., Baffuto, G., & Biglan, A. (2020). First things first: Parent psychological flexibility and self-compassion during COVID-19. *Behavior Analysis in Practice*, 1–7. https://doi.org/10.1007/s40617-020-00435-w

Cree, M. (2010). Compassion focused therapy with perinatal and mother-infant distress. *International Journal of Cognitive Therapy, 3*(2), 159–171. https://doi.org/10.1521/ijct.2010.3.2.159

Das, R. (2020). *COVID-19, perinatal mental health and the digital pivot*. Guilford.

Davenport, M., Meyer, S., Meah, V., Strynadka, M., & Khurana, R. (2020). Moms are not OK: COVID-19 and maternal mental health. *Frontiers in Global Women's Health, 1*. https://doi.org/10.3389/fgwh.2020.00001

DGS (2020a). *Orientação no 018/2020 - COVID-19: Gravidez e parto*. Retrieved november, 2020 from https://www.dgs.pt/normas-orientacoes-e-informacoes/orientacoes-e-circulares-informativas/orientacao-n-0182020-de-30032020-pdf.aspx

DGS (2020b). *Quem está em risco?* Retrieved june, 2020 from https://covid19.min-saude.pt/quem-esta-em-risco/

Duncan, L. G., Coatsworth, J. D., & Greenberg, M. T. (2009). A model of mindful parenting: Implications for parent-child relationships and prevention research. *Clinical Child and Family Psychology Review, 12*(3), 255–270. https://doi.org/10.1007/s10567-009-0046-3

Fallon, V., Silverio, S. A., Halford, J. C. G., Bennett, K. M., & Harrold, J. A. (2019). Postpartum-specific anxiety and maternal bonding: Further evidence to support the use of childbearing specific mood tools. *Journal of Reproductive and Infant Psychology*, 1–11. https://doi.org/10.1080/02646838.2019.1680960

Fernandes, D. V., Canavarro, M. C., & Moreira, H. (2021). The mediating role of parenting stress in the relationship between anxious and depressive symptomatology, mothers' perception of infant temperament, and mindful parenting during the postpartum period. *Mindfulness*, *12*(2), 275–290. https://doi.org/10.1007/s12671-020-01327-4

Kristensen, I. H., Simonsen, M., Trillingsgaard, T., Pontoppidan, M., & Kronborg, H. (2018). First-time mothers' confidence mood and stress in the first months postpartum: A cohort study. *Sexual & Reproductive Healthcare*, *17*, 43–49. https://doi.org/10.1016/j.srhc.2018.06.003

Matvienko-Sikar, K., Meedya, S., & Ravaldi, C. (2020). Perinatal mental health during the COVID-19 pandemic. *Women and Birth: Journal of the Australian College of Midwives*, *33*(4), 309–310. https://doi.org/10.1016/j.wombi.2020.04.006

Medeiros, C., Gouveia, M. J., Canavarro, M. C., & Moreira, H. (2016). The indirect effect of the mindful parenting of mothers and fathers on the child's perceived well-being through the child's attachment to parents. *Mindfulness*, *7*(4), 916–927. https://doi.org/10.1007/s12671-016-0530-z

Mixão, M. L., Leal, I., & Maroco, J. (2010). Avaliação em sexualidade e parentalidade. In I. Leal, & J. Maroco (Eds.), *Escala de stress parental [Parental Stress Scale]*. LivPsic.

Moreira, H., & Canavarro, M. C. (2017). Psychometric properties of the Interpersonal Mindfulness in Parenting Scale in a sample of Portuguese mothers. *Mindfulness*, *8*(3), 691–706. https://doi.org/10.1007/s12671-016-0647-0

Moreira, H., Fonseca, A., Caiado, B., & Canavarro, M. C. (2019). Work-family conflict and mindful parenting: The mediating role of parental psychopathology symptoms and parenting stress in a sample of portuguese employed parents. *Frontiers in Psychology*, *10*(635). https://doi.org/10.3389/fpsyg.2019.00635

Nazaré, B., Fonseca, A., & Canavarro, M. C. (2012). *Postpartum Bonding Questionnaire: estudo da versão portuguesa numa amostra comunitária*. VIII Congresso Iberoamericano de Avaliação Psicológica/XV Conferência Internacional de Avaliação Psicológica: Formas e Contextos.

Nolvi, S., Karlsson, L., Bridgett, D. J., Pajulo, M., Tolvanen, M., & Karlsson, H. (2016). Maternal postnatal psychiatric symptoms and infant temperament affect early mother-infant bonding. *Infant Behavior and Development*, *43*, 13–23. https://doi.org/10.1016/j.infbeh.2016.03.003

Pais-Ribeiro, J., Silva, I., Ferreira, T., Martins, A., Meneses, R., & Baltar, M. (2007). Validation study of a Portuguese version of the Hospital Anxiety and Depression Scale. *Psychology, Health & Medicine*, *12*(2), 225–237.

Pickard, J. A., Townsend, M., Caputi, P., & Grenyer, B. F. S. (2017). Observing the influence of mindfulness and attachment styles through mother and infant interaction: A longitudinal study. *Infant Ment Health Journal*, *38*(3), 343–350. https://doi.org/10.1002/imhj.21645

Potharst, E. S., Aktar, E., Rexwinkel, M., Rigterink, M., & Bögels, S. M. (2017). Mindful with your baby: Feasibility, acceptability, and effects of a mindful parenting group training for mothers and their babies in a mental health context. *Mindfulness*, *8*(5), 1236–1250. https://doi.org/10.1007/s12671-017-0699-9

Potharst, E. S., Boekhorst, M., Cuijlits, I., van Broekhoven, K. E. M., Jacobs, A., Spek, V., Nyklicek, I., Bögels, S. M., & Pop, V. J. M. (2019). A Randomized Control Trial evaluating an online mindful parenting training for mothers with elevated parental stress. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.01550

Reck, C., Zietlow, A. L., Müller, M., & Dubber, S. (2016). Perceived parenting stress in the course of postpartum depression: The buffering effect of maternal bonding. *Archives of Women's Mental Health*, *19*(3), 473–482. https://doi.org/10.1007/s00737-015-0590-4

Siegel, D., & Hartzell, M. (2013). *Parenting from the inside out: How a deeper self-understanding can help you raise children who thrive*. Penguin.

Snaith, R. P. (2003). The Hospital Anxiety And Depression Scale. *Health and Quality of Life Outcomes*, *1*, 29. https://doi.org/10.1186/1477-7525-1-29

Stuebe, A. (2020). Should Infants be separated from mothers with COVID-19? First, do no harm. *Breastfeeding Medicine*, *15*(5), 351–352. https://doi.org/10.1089/bfm.2020.29153.ams

Suzuki, S. (2020). Psychological status of postpartum women under the COVID-19 pandemic in Japan. *The Journal of Maternal-Fetal & Neonatal Medicine*, 1–3. https://doi.org/10.1080/14767058.2020.1763949

Teti, S., Cummings, C., King, L., Coleman, C., Mitchell, C., & Tabari, K. (2020). Should new mothers with Covid-19 be separated from their newborns? *The Hastings Center Report*.

Thapa, S. B., Mainali, A., Schwank, S. E., & Acharya, G. (2020). Maternal mental health in the time of the COVID-19 pandemic. *Acta Obstetricia et Gynecologica Scandinavica*, *99*, 817–818. https://doi.org/10.1111/aogs.13894

Tolja, R., Nakić Radoš, S., & Anđelinović, M. (2020). The role of maternal mental health, infant temperament, and couple's relationship quality for mother-infant bonding. *Journal of Reproductive and Infant Psychology*, 1–13. https://doi.org/10.1080/02646838.2020.1733503

Wada, F. H., Prabandari, Y. S., & Hapsari, E. D. (2020). Bonding and attachment experience among postnatal mothers with spontaneous childbirth. *Belutin Nursing Journal*, *6*(1), 7. https://doi.org/10.33546/bnj.779

Yanyu, J., Xi, Y., Huiqi, T., Bangjiang, F., Bin, L., Yabin, G., Xin, M., Junhua, Z., Zhitao, Y., Xiaoyun, C., Changsheng, D., Yanmei, Z., jianguang, X., & Lijun, J. (2020). Meditation-based interventions might be helpful for coping with the Coronavirus disease 2019 (COVID-19). *OSF Reprints*. https://doi.org/10.31219/osf.io/f3xzq

Zanardo, V., Manghina, V., Giliberti, L., Vettore, M., Severino, L., & Straface, G. (2020). Psychological impact of COVID-19 quarantine measures in northeastern Italy on mothers in the immediate postpartum period. *International Journal of Gynecology & Obstetrics*, *150*, 184–188. https://doi.org/10.1002/ijgo.13249