

**Mother-infant bonding screening in a sample of postpartum women:  
Comparison between online vs offline format**

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## **ABSTRACT**

**Aims:** The use of the internet to assess mother-infant bonding (MIB) has not been extensively examined. The main aim of this study was to compare offline (paper-and-pencil) and online MIB screening in a sample of n=1,269 women. We tested the reliability and factorial structure of the Postpartum Bonding Questionnaire (PBQ) and also compared clinical, obstetrical, reproductive, and psychopathological variables related to poor MIB.

**Methods:** A cross-sectional study was conducted on 1,269 mothers. The offline group included 812 women who attended a 40-day postpartum clinical appointment. The online group consisted of 457 women recruited during admission for delivery who volunteered to carry out the online protocol 40 days postpartum. All the participants individually completed the PBQ, the Edinburg Postnatal Depression Scale (EPDS) and a questionnaire on other clinical and sociodemographic variables.

**Results:** The 4-factor solution proposed in the PBQ and its Spanish validation showed good model fit for both the offline and the online sample. Women assessed through the online format reported higher levels of stress, depressive symptoms, and poor bonding, specifically on PBQ scores and the Rejection and Anger subscales. The offline and online assessments obtained the same results regarding the type of statistical associations between PBQ and sociodemographic, reproductive, obstetric and psychological outcomes.

**Conclusion:** Online assessment may be an appropriate option for detecting possible alterations in MIB due to the reduction of desirability bias, the increased perception of anonymity, and being a more cost-effective method.

**Keywords:** bonding, online, internet, offline, assessment, postpartum.

## INTRODUCTION

The ability of health-care systems to provide accessible, effective and affordable options to treat mental disorders has become a growing international concern (Hollis et al., 2018). To this end, the World Psychiatric Association-Lancet Psychiatry Commission on the Future of Psychiatry highlighted the potential of digital technologies (e.g. internet, smartphones and wearables) to connect patients and services through flexible and less stigmatizing approaches (Naslund et al., 2017). These technologies have enhanced opportunities for the diagnosis, monitoring, prevention and treatment of different mental disorders (Patel & Saunders, 2018).

Online screening for psychopathology is widely used for some psychiatric disorders, such as major depressive disorder (Houston et al., 2001), with similar results when comparing online assessment to paper-based screening (Cronly et al., 2018). Likewise, numerous studies have taken advantage of online methods to detect psychopathology during the COVID-19 pandemic (González-Sanguino et al., 2020; Tan et al., 2020) thanks to the ease of accessing individuals online.

In the case of psychopathology during the perinatal period (from pregnancy to one year after birth), and more specifically regarding postpartum, technology holds great promise as a useful tool (O'Hara & Wisner, 2014; Osma, Barrera, & Ramphos, 2016). There has been, for example, a growing interest in assessing the utility of these technologies for postpartum depression (PPD) screening (Drake, Howard, & Kinsey, 2014), prevention (Duffecy et al., 2019; Shorey et al., 2019) and treatment (Milgrom et al., 2016; Roman, Constantin, & Bostan, 2020). Other research has examined the degree of acceptance and recommendation of applications related to perinatal mental health professionals (Osma, Sprenger & Mettler, 2017). Specifically, online screening methods have been described as a viable and useful option to be incorporated into comprehensive screening, referral and treatment plans for PPD (Drake et al., 2014; Le, Perry, & Sheng, 2009). However, there are some challenges when assessing PPD online, such as the online anonymous assessment not allowing clinicians to know if the assessed women will seek treatment (Le, Perry, & Sheng, 2009).

The use of technologies to address other essential clinical factors, such as impaired mother-infant bonding (MIB), has not been fully studied. MIB is defined as the emotional relationship between a mother and her newborn, shaped using adaptive maternal behaviors during the early postpartum stage (Feldman, 2009). Pre-delivery and post-partum clinical features, such as anxiety during pregnancy, self-reported suicidality, demographic characteristics (low socio-economic status), PPD and mode of delivery, are associated with poor MIB (Daglar & Nur, 2018; Farré-Sender et al., 2018; Kommers, Truijens, Oei, Bambang Oetomo, & Pop, 2017). A routine screening for MIB is considered essential due to the impact MIB can have on the social,

cognitive, neurological and emotional development of newborns (Daglar & Nur, 2018; Ranson & Urichuk, 2008).

However, barriers for mothers during the postnatal period (e.g., difficulties travelling to appointments, and combining childcare and face-to-face consultations) make it difficult to systematically evaluate MIB or other associated clinical difficulties, such as anxiety or PPD (Fallon, Silverio, Halford, Bennett, & Harrold, 2019; Martínez-Borba, Suso-Ribera, & Osma, 2018; Radoš, Tadinac, & Herman, 2018). To overcome these limitations, the implementation of e-screening procedures has been recommended. This is because of their capacity to optimize privacy, the handling of missing data, and the interpretation of results (Learman, 2018).

However, there is still no consensus on possible differences between online and offline screening tools. These differences include aspects such as the responses of the participants, validity, reliability, factor structure (Vleeschouwer et al., 2014), as well as possible consequences for the integrity of data collected online (Brock, Barry, Lawrence, Dey, & Rolffs, 2012). These hypothetical differences could be due to some modulating variables which may modify the attitude of the participants toward e-screening, such as self-disclosure, or computer anxiety (Vallejo, Jordán, Díaz, Comeche, & Ortega, 2007). Regarding MIB, this discussion has barely been formulated, and research on this topic is lacking.

As such, the main aim of this study was to compare offline (paper-and-pencil) and online MIB screening in a sample of 1,269 women. We analyzed the reliability and factorial structure of the Postpartum Bonding Questionnaire (PBQ; Brockington et al., 2001) in both groups (offline and online) and also compared the assessment of sociodemographic, reproductive, obstetric and psychological features related with MIB alterations. We hypothesized that the PQB would be a reliable instrument to assess MIB and expected to replicate the four-factor solution proposed in the PBQ (Brockington et al., 2001) and its Spanish validation (Garcia-Esteve et al., 2016). Additionally, we hypothesized that there would be no noticeable difference in MIB according to the format of screening used (online vs. offline), as observed in other clinical conditions (Pimenta et al., 2019).

## **METHODS**

### **Study design**

A cross-sectional study was conducted.

### **Sample and procedure**

The present study was conducted at a tertiary hospital in Barcelona, Spain between January 2013 and March 2015. The sample consisted of 1,269 women that were evaluated 30-40 days after giving birth. Figure 1 shows the flow chart of the study.

[INSERT FIGURE 1]

The sample was made up of two groups: an offline group (n=812) and online group (n= 457). The offline group included women who attended a 40-day-postpartum clinical appointment. Participants were recruited by nurses through convenience sampling and were selected based on availability. Women in the offline group voluntarily and individually completed all the questionnaires by hand required for this study prior to the obstetric appointment (requiring approximately 10-15 minutes).

The online group was recruited by nurses during hospital admission for childbirth at the same hospital. Online participants volunteered to carry out the online protocol after 40 days and were also recruited via convenience sampling. The assessment was carried out using an online platform designed by the hospital's Perinatal Mental Health and Reproductive Unit at the Department of Psychiatry. The time required to answer the online survey was 10-15 minutes. The participants received an email at their personal email address containing the informed consent form and a link to access the evaluation.

In the case of the offline group, the inclusion criteria were: attending the gynecological quarantine follow-up appointment and having a living baby. In the online group, the inclusion criteria were: being admitted to hospital for delivery (1st week postpartum), being the mother of a living baby and agreeing to perform the online assessment 40 days later.

## **Measures**

### Clinical outcomes:

*The Postpartum Bonding Questionnaire (PBQ;* Brockington et al., 2001). The PBQ is a reliable screening measure for MIB and attachment disorders. It consists of 25 questions rated on a 6-point Likert scale (0-5) assessing the mother's feelings and attitudes towards the infant. Items 1, 4, 8, 9, 11, 16, 22 and 25 are scored from 0 = "not at all" to 5 = "always" and all other items are valued inversely. The maximum score is 125 and it has a minimum cut-off value of 26 indicating the presence of any type of bonding disorder. Therefore, a higher score on the PBQ refers to poorer bonding. A validated Spanish version of the PBQ was used in this study (Garcia-Esteve et al., 2016). In the PBQ and its Spanish validation, the questionnaire is organized in four subscales: a general impaired bonding factor, rejection and anger, anxiety about the infant, and incipient abuse. It has a sensibility of 84%, a specificity of 74% and a

positive predictive value (PPV) of 79% when scores are equal or higher than 26 (Garcia-Esteve et al., 2016).

*The Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987).* The EPDS is a 10-item self-report questionnaire, designed to identify depressive symptoms during the peripartum period. It includes items concerning anxiety, sadness, sleep and thoughts of harming oneself. Items are scored on a 4-point scale ranging from 0 to 3. Items 1 and 2 are scored from 0 = “As much as always” to 3 = “Not at all”, and items 3–10 are valued inversely. The maximum score is 30 and higher scores indicate more depressive symptoms. The Spanish validation of the EPDS was used in this study and a cutoff point of  $\geq 11$  was used to identify the presence of postpartum depression (Garcia-Esteve, Ascaso, Ojuel, & Navarro, 2003). The Cronbach alpha in our sample was  $\alpha=0.83$  ( $\alpha=0.82$  for *offline* sample and  $\alpha=0.84$  for the *online* sample).

#### Sociodemographic and other variables:

Additional information was also collected, including *sociodemographic characteristics*: age, education level and employment status; *obstetric and reproductive data*: reproduction type (natural/assisted reproduction), delivery type (vaginal/cesarean section), type of infant feeding (breastfeeding/ mixed or infant formula) and parity (primiparous/multiparous); and *psychological factors*: anxiety or depression lifetime, anxiety or depression during pregnancy and stress during pregnancy or postpartum).

#### **Ethics**

The present study was carried out in accordance with the latest version of the Declaration of Helsinki. The Hospital Ethics Committee of Clinical Research approved the study, and written informed consent was obtained from all participants. The evaluation was anonymous for all participants and a code was assigned to each of them. The research team for the present study were the only individuals with access to this assigned code and the clinical case number for each participant.

The online data collection platform was specially designed to ensure the protection of personal data as indicated by Spanish data protection law. The online data were stored in a file that was cleared as required by LOPD (Spanish law) and regulated by a contract with the company that manages the data collection platform. Likewise, the use of this platform was approved by the Hospital Ethics Committee of Clinical Research.

#### **Statistical analysis**

Due to the high proportion of missing data in the offline sample (N=812), a set of comparisons between completers (n=142) and non-completers (n=670) were conducted. Second,

Confirmatory Factor Analyses (CFA) were performed with mPlus version 6.12 (Muthén & Muthén, 2011) to investigate whether the four-factor solution proposed in the PBQ (Brockington et al., 2001) and its Spanish Validation (Garcia-Esteve et al., 2016) showed a good fit in both groups (offline and online). Given that items are ordered categorically (ordinal), the weighted least square mean and variance adjusted estimator (WLSMV) was used (Li, 2016). Fit indices are Chi square test ( $\chi^2$ ), the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). CFI and TLI  $\geq$  .90 and RMSEA below .08 are indicators of good model fit (Hu & Bentler, 1999).

Descriptive analyses were conducted for each of the samples (offline and online). T-student tests for continuous variables and *chi square* test for dichotomous variables were conducted to explore differences in sociodemographic, reproductive, obstetric and psychological variables as a function of assessment format (offline vs online). Parametric tests were used after verifying that the data for the dependent variable (format screening type) were normally distributed ( $p = 0.137$ ) using the Kolmogorov-Smirnov test. Finally, Pearson correlations were conducted to explore the associations between the sociodemographic, reproductive, obstetric and psychological variables and the PBQ total score. The aforementioned bivariate correlations were conducted separately depending on the sample (offline and online) in order to observe if associations change as a function of assessment format. Finally, Cronbach alphas were calculated to assess measures' internal reliability. Except for the CFA, all statistical analysis were carried out with SPSS v.22 (IBM Corp, 2013). Due to the large number of statistical comparison and to reduce the risk of type I errors, the Holm-Bonferroni correction was used and a more restrictive  $\alpha$  level of .01 was set for all analyses (Holm, 1979).

## **RESULTS**

### **Acceptability of the study**

98.6 % of women agreed to participate in the study using the offline format and 98.5% using the online format. However, only 49.1% of the online group completed the questionnaires when they were received using the online format.

Some women did not adequately complete all paper and pencil questionnaires and 11.06% of participants had some sort of missing data in the offline format, versus 0% in the online format. Likewise, in the offline sample, there was considerable incomplete sociodemographic data regarding education level and employment status. In order to guarantee that missing data in the offline sample did not influence the reliability of our results, a comparison between completers and non-completers was conducted. As observed in Table 1, no significant differences between



completers and non-completers offline participants emerged. In an effort to not to lose valuable information, subsequent analyses were conducted with the whole offline sample (n=812).

[INSERT TABLE 1]

### **PBQ Confirmatory factor analyses for offline and online samples**

The confirmatory factor analyses for the 4-factor solution proposed in the PBQ (Brockington et al., 2001) and its Spanish validation (Garcia-Esteve et al., 2016) showed a good model fit for both the offline ( $\chi^2 = 887.06$ ,  $df = 246$ ,  $p < .001$ ,  $RMSEA = 0.057$ , 90% CI  $RMSEA = 0.053$ ,  $0.061$ ,  $CFI = 0.921$ ,  $TLI = 0.911$ ) and online groups ( $\chi^2 = 617.08$ ,  $df = 269$ ,  $p < .001$ ,  $RMSEA = 0.053$ , 90% CI  $RMSEA = 0.048$ ,  $0.059$ ,  $CFI = 0.958$ ,  $TLI = 0.953$ ). In the present study, the Cronbach's alpha coefficient for the full scale was 0.92 for the whole sample, 0.92 for the offline format and 0.90 for the online format. Regarding PBQ subscales, reliability for impaired bonding, rejection and anger, anxiety about the infant and incipient abuse scales was 0.87; 0.80; 0.84 and 0.83 in offline participants and 0.79; 0.84; 0.84; 0.47 in online participants.

### **Differences in sociodemographic, reproductive, and obstetric outcomes**

The characteristics of the sample are described in Table 2. There were significant differences between both samples (offline and online) regarding education level, type of reproduction method, type of delivery method and parity. Women recruited offline had lower education levels and less previous children compared to women who responded online. Additionally, women in the offline sample had a natural reproduction and a vaginal delivery more frequently compared to online sample (all  $p < .010$ ).

[INSERT TABLE 2]

### **Differences between samples in psychological variables and clinical outcomes**

Regarding psychiatric history, in both groups, more than 60% reported no lifetime anxiety or depression, and, during pregnancy, the percentage of mothers with anxiety or depression was almost 15%, without significant differences between groups. However, as showed in table 3, significant differences between groups were found in stress during pregnancy or postpartum. The reported prevalence of stress during pregnancy or postpartum was higher in the group of women who responded online, in comparison with women recruited offline ( $p < .001$ ).

Table 3 also showed differences between groups in clinical outcomes (EDPS and PBQ). As observed, EPDS mean scores were higher in online sample, and this difference was statistically significant ( $p < .001$ ). Regarding the PBQ total score, we found statistically significant differences between the two assessment formats, with poorer bonding observed in the online

group (Table 3). Attending to PBQ subfactors, the online group reported poorer bonding in all subscales (impaired bonding, rejection and anger and anxiety about infant; all  $p < .010$ ) except in incipient abuse ( $p = .031$ ).

[INSERT TABLE 3]

### **Associations between sociodemographic, reproductive, obstetric and psychological variables and PBQ scores**

Table 4 shows the bivariate associations between the PBQ and the sociodemographic, reproductive, obstetrics and psychological variables in both detection formats. Both offline and online participants have the same results regarding the type of statistical associations between the variables. Only parity appear as a variable in which the evaluation type alters this association (offline:  $r = -.12$ ,  $p < .001$ ; online:  $r = -.03$ ,  $p = .536$ ). Primiparous women assessed offline reported lower scores in bonding alterations while this association was not observed in the online sample. However, although significant, this correlation was low.

[INSERT TABLE 4]

## **DISCUSSION**

The present study analyzed, in a sample of 1,269 women, the comparability offline and online clinical MIB screening. In addition, the sociodemographic, obstetrical, reproductive and psychopathological variables related with MIB alterations were compared.

Both groups of mothers showed high participation percentages, in the line with both offline (Logsdon et al., 2018) and online (Drake et al., 2014; Le et al., 2009) studies. However, the online group showed a lower response rate in comparison with the offline group. This is agreement with previous studies during the perinatal period (Drake et al, 2014; Lee, Denison, Hor, & Reynolds, 2016) and could be explained by the delay between when mothers were invited to participate in the study (they were informed about the study during hospital admission for childbirth) and when the survey was due, via a link 40 days later. Not having a healthcare professional present and the demanding nature of the early postpartum period could also have contributed to lower participation levels.

While the offline system showed a high prevalence of missing data on the PBQ, the online detection did not show any completion errors, because it is not possible to save the data if all the questions of the questionnaire are not answered. This is a clear advantage, since the goal of the online evaluation programs is to make data entry accurate and efficient (Burhansstipanov et al., 2012).

According to our results, the PBQ maintained the internal structure proposed in the PBQ (Brockington et al., 2001) and its Spanish validation (Garcia-Esteve et al., 2016) when administered online. The four-factor solution showed a good fit in both samples offline and online. It was also found high internal consistency both in the offline ( $0.80 \geq \alpha \leq 0.92$ ) and online ( $0.47 \geq \alpha \leq 0.90$ ) groups. Similarly with Spanish validation, the lowest Cronbach's alpha was found in incipient abuse subscale (Garcia-Esteve et al., 2016) in online sample. Several factors may explain low reliability indices, attending to our results it is possible that the reduced number of items comprised in incipient abuse subscale, together with the homogeneous responses (specially in online sample) may explain our results (Morales, 2008). However, considering this finding altogether, it seems that the PBQ could be a valid and reliable measure for the online assessment of MBI.

There were significant differences between both samples (offline and online) regarding academic level, type of reproduction, type of delivery and parity. Specifically, women completing online evaluations had a higher education level, higher conception by assisted reproductive techniques, higher cesarean delivery rates and a greater number of women were primiparous. However, most of these differences should not influence the results obtained on the MIB. In fact, no differences in infant attachment and mother-child interaction have been found in mothers who have conceived through ART compared to natural conception, during the first postpartum year (Gibson, Ungerer, McMahon, Leslie, & Saunders, 2000). Regarding type of delivery, the few studies in this line have found no effect on type of delivery on MIB (Figueiredo, Costa, Pacheco, & Pais, 2009; Noyman-Veksler, Herishanu-Gilutz, Kofman, Holchberg, & Shahar, 2015). Nevertheless, the authors suggested the possible existence of individual differences in this association and stress, that possible moderators in this association, such as social support, should be taken into account (Noyman-Veksler et al., 2015). Regarding parity, some studies conducted in Japanese mothers, have found an association between primiparous mothers and worse MIB, but it was contingent on the presence of postpartum depression (Tsuchida et al., 2019) and the type of delivery (Yoshida, Matsumura, Tsuchida, Hamazaki, & Inadera, 2020), while other studies in Spanish samples did not find this association (Farré-Sender et al., 2018).

When comparing both groups, statistically significant differences were obtained in relation to reported perinatal stress and the presence of depressive symptoms, and bonding scores. However, it should be noted that in the present study the online group was recruited face-to-face, not through social networks or other online sources. Therefore, even more pronounced differences may be expected when the sample is recruited online. The online group endorsed greater perinatal stress and worse depressive symptomatology, and poorer bonding than the offline group in all subscales (impaired bonding, rejection and anger and anxiety about infant),

except in incipient abuse. About half of the women did not answer the online evaluation and, it's possible that the women who answered the questionnaire online were in the worst mood, which could lead to a worse MIB, given the association between PPD and bonding disorders (Field, 2010; Reck, Zietlow, Müller, & Dubber, 2016; Tolja, Nakić Radoš, & Anđelinović, 2020). Another explanation is that online assessments significantly reduce social desirability effects, as previous authors have suggested (Joinson, 1999). It should also be noted that in the specific case of MIB, social desirability has been described as a risk factor (Tsuchida et al., 2019). Moreover, public acknowledgement of difficulties with MIB tends to be associated with fear of stigma, so the anonymity offered by the internet might provide mothers with more confidence to recognize it. In this regard, it should be noted that one of the factors of PBQ significantly more present in the online format was "Rejection and Anger", which is associated with risk of abuse and corresponds to highly stigmatizing maternal emotions (Garcia-Esteve et al., 2016).

Along with this factor, multiple advantages of online evaluation have been proposed, such as the format being less time consuming, less costly, providing easy access to large samples, preference of the participants, automated data entry, and the reduction of errors and missing data (Kongsved, Basnov, Holm-Christensen, & Hjollund, 2007; Vispoel, Boo, & Bleiler, 2001). The online format also allows MIB to be evaluated continuously during the postpartum period, resulting in a more cost-effective method since mothers do not need to be attended by a healthcare professional.

Offline and online assessments obtained the same results regarding the type of statistical associations between the independent variables (clinical, obstetrical, reproductive and psychopathological variables). In both screening formats, higher MIB scores were significantly associated with anxiety or depression throughout life, anxiety or depression during pregnancy, stress during pregnancy or postpartum period and PPD, in line of previous studies (Daglar & Nur, 2018; Fallon, Silverio, Halford, Bennett, & Harrold, 2019; Farré-Sender et al., 2018; Field, 2010; Tolja, Nakić Radoš, & Anđelinović, 2020). This leads us to hypothesize that the two types of evaluation do not differ in measuring these factors associated with the MIB. However, in the case of parity, this association was different according to the screening format. This discrepancy could be explained by the fact that the association between parity and MIB is not clear. As previously mentioned, according to some research on Asian women, parity has been considered a maternal risk factor in MIB (Tsuchida et al., 2019), while other studies on Spanish samples do not find this association (Farré-Sender et al., 2018).

### **Limitations and future research**

The findings of this study should be considered with certain caveats in mind. First, online and offline group were not randomly controlled for psychosocial variables relevant for MIB. As such, in the offline group, more women with good mental health were likely willing to participate than in the online group. Second, online data collection has some drawbacks (Berthelot, Batard, le Goff, & Maugars, 2013). A clear example of this would be that, of the participants who accepted, the final participation rate was less than 50%. Despite the frequent use and the positive attitude and acceptance of internet questionnaires by perinatal women (Osma et al., 2016), and also by perinatal health professionals (Sprenger, Mettler, & Osma, 2017), the use of an online platform was a cause of significant sample loss in the present study, in line with previous online research (Berthelot et al., 2013) . The inclusion of information, reminders, tips, treatment elements or gamification in the online applications might facilitate engagement with online studies (Sardi, Idri, & Fernández-Alemán, 2017). It should also be taken into account that future studies may include follow-ups, since the different variables evaluated can vary over time, as is the case of attachment with the newborn (Chambers, 2017). Future studies may evaluate these factors, including the father figure, as previous studies have done (Musser, Ahmed, Foli, & Coddington, 2013; Pace et al., 2016). Finally, the present study was carried out between 2013 and 2015, and technology has evolved since then. Users' mastery of online platforms is greater at present and, therefore, the results should be interpreted in the technological context in which the evaluation was carried out.

## **CONCLUSION**

Offline and online assessments of MIB reported similar results, replicating in both samples the four-factor internal structure proposed in the Spanish validation of the PBQ. However, the online assessment seems to have additional benefits for detecting poor MIB possibly due to the reduction of desirability bias, as well as to the increased perception of anonymity. These characteristics, together with its cost-efficiency for perinatal women and health systems, make the online screening of MBI an advisable method. However, future efforts should be conducted to improve women's engagement with online programs.

## **CONFLICT OF INTEREST**

None

## REFERENCES

- Berthelot, J., Batard, K., le Goff, B., & Maugars, Y. (2013). Online home self-assessment: A tool for improving future treatment trials? *Joint Bone Spine*, *80*(1), 5–7.  
<https://doi.org/10.1016/j.jbspin.2012.10.005>
- Brock, R. L., Barry, R. A., Lawrence, E., Dey, J., & Rolffs, J. (2012). Internet Administration of Paper-and-Pencil Questionnaires Used in Couple Research: Assessing Psychometric Equivalence. *Assessment*, *19*(2), 226–242. <https://doi.org/10.1177/1073191110382850>
- Brockington, I. F., Oates, J., George, S., Turner, D., Vostanis, P., Sullivan, M., ... Murdoch, C. (2001). A screening questionnaire for mother-infant bonding disorders. *Archives of Women's Mental Health*, *3*(4), 133–140. <https://doi.org/10.1007/s007370170010>
- Burhansstipanov, L., Clark, R. E., Watanabe-Galloway, S., Petereit, D. G., Eschiti, V., Krebs, L. U., & Pingatore, N. L. (2012). Online Evaluation Programs: Benefits and Limitations. *Journal of Cancer Education : The Official Journal of the American Association for Cancer Education*, *27*(Suppl 1), 24-31. <https://doi.org/10.1007/S13187-012-0320-9>
- Chambers, J. (2017). The Neurobiology of Attachment: From Infancy to Clinical Outcomes. *Psychodynamic Psychiatry*, *45*(4), 542–563. <https://doi.org/10.1521/pdps.2017.45.4.542>
- Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry : The Journal of Mental Science*, *150*, 782–786. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/3651732>
- Cronly, J., Duff, A. J., Riekert, K. A., Perry, I. J., Fitzgerald, A. P., Horgan, A., ... Savage, E. (2018). Online versus paper-based screening for depression and anxiety in adults with cystic fibrosis in Ireland: a cross-sectional exploratory study. *BMJ Open*, *8*(1), e019305. <https://doi.org/10.1136/bmjopen-2017-019305>
- Daglar, G., & Nur, N. (2018). Level of mother-baby bonding and influencing factors during pregnancy and postpartum period. *Psychiatria Danubina*, *30*(4), 433–440. <https://doi.org/10.24869/psyd.2018.433>
- Drake, E., Howard, E., & Kinsey, E. (2014). Online screening and referral for postpartum depression: an exploratory study. *Community Mental Health Journal*, *50*(3), 305–311. <https://doi.org/10.1007/s10597-012-9573-3>
- Duffecy, J., Grekin, R., Hinkel, H., Gallivan, N., Nelson, G., & O'Hara, M. W. (2019). A

group-based online intervention to prevent postpartum depression (Sunnyside): Feasibility randomized controlled trial. *Journal of Medical Internet Research*, 21(5), e10778.  
<https://doi.org/10.2196/10778>

- Fallon, V., Silverio, S. A., Halford, J. C. G., Bennett, K. M., & Harrold, J. A. (2019b). Postpartum-specific anxiety and maternal bonding: Further evidence to support the use of childbearing specific mood tools. *Journal of Reproductive and Infant Psychology*, 39(2), 114–124. <https://doi.org/10.1080/02646838.2019.1680960>
- Farré-Sender, B., Torres, A., Gelabert, E., Andrés, S., Roca, A., Lasheras, G., ... Garcia-Esteve, L. (2018). Mother–infant bonding in the postpartum period: assessment of the impact of pre-delivery factors in a clinical sample. *Archives of Women's Mental Health*, 21(3), 287–297. <https://doi.org/10.1007/s00737-017-0785-y>
- Feldman, R. (2009). The development of regulatory functions from birth to 5 Years: Insights from premature infants. *Child Development*, 80(2), 544–561.  
<https://doi.org/10.1111/j.1467-8624.2009.01278.x>
- Field, T. (2010). Postpartum depression effects on early interactions, parenting, and safety practices: a review. *Infant Behavior & Development*, 33(1), 1–6.  
<https://doi.org/10.1016/j.infbeh.2009.10.005>
- Figueiredo, B., Costa, R., Pacheco, A., & Pais, Á. (2009). Mother-to-Infant Emotional Involvement at Birth. *Maternal and Child Health Journal*, 13(4), 539–549.  
<https://doi.org/10.1007/s10995-008-0312-x>
- Garcia-Esteve, L., Ascaso, C., Ojuel, J., & Navarro, P. (2003). Validation of the Edinburgh Postnatal Depression Scale (EPDS) in Spanish mothers. *Journal of Affective Disorders*, 75(1), 71–76. [https://doi.org/10.1016/S0165-0327\(02\)00020-4](https://doi.org/10.1016/S0165-0327(02)00020-4)
- Garcia-Esteve, L., Torres, A., Lasheras, G., Palacios-Hernández, B., Farré-Sender, B., Subirà, S., ... Brockington, I. F. (2016). Assessment of psychometric properties of the Postpartum Bonding Questionnaire (PBQ) in Spanish mothers. *Archives of Women's Mental Health*, 19(2), 385–394. <https://doi.org/10.1007/s00737-015-0589-x>
- Gibson, F. L., Ungerer, J. A., McMahon, C. A., Leslie, G. I., & Saunders, D. M. (2000). The mother-child relationship following in vitro fertilisation (IVF): infant attachment, responsivity, and maternal sensitivity. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 41(8), 1015–1023. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/11099118>

- González-Sanguino, C., Ausín, B., Castellanos, M. Á., Saiz, J., López-Gómez, A., Ugidos, C., & Muñoz, M. (2020). Mental health consequences during the initial stage of the 2020 Coronavirus pandemic (COVID-19) in Spain. *Brain, Behavior, and Immunity*, 87, 172–176. <https://doi.org/10.1016/j.bbi.2020.05.040>
- Hollis, C., Sampson, S., Simons, L., Davies, E. B., Churchill, R., Betton, V., ... Tomlin, A. (2018). Identifying research priorities for digital technology in mental health care: results of the James Lind Alliance Priority Setting Partnership. *The Lancet Psychiatry*, 5(10), 845–854. [https://doi.org/10.1016/S2215-0366\(18\)30296-7](https://doi.org/10.1016/S2215-0366(18)30296-7)
- Holm, S. (1979). A simple sequential rejective method procedure. *Scandinavian Journal of Statistics*, 6(2), 65–70.
- Houston, T. K., Cooper, L. A., Vu, H. T., Kahn, J., Toser, J., & Ford, D. E. (2001). Screening the public for depression through the Internet. *Psychiatric Services (Washington, D.C.)*, 52(3), 362–367. <https://doi.org/10.1176/appi.ps.52.3.362>
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- IBM Corp. (2013). IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.
- Joinson, A. (1999). Social desirability, anonymity, and Internet-based questionnaires. *Behavior Research Methods, Instruments, and Computers*, 31(3), 433–438. <https://doi.org/10.3758/BF03200723>
- Kommers, D. R., Truijens, S. E. M., Oei, S. G., Bambang Oetomo, S., & Pop, V. J. M. (2017). Antenatal mother-infant bonding scores are related to maternal reports of infant crying behaviour. *Journal of Reproductive and Infant Psychology*, 35(5), 480–492. <https://doi.org/10.1080/02646838.2017.1354360>
- Kongsved, S. M., Basnov, M., Holm-Christensen, K., & Hjollund, N. H. (2007). Response rate and completeness of questionnaires: A randomized study of internet versus paper-and-pencil versions. *Journal of Medical Internet Research*, 9(3), e25. <https://doi.org/10.2196/jmir.9.3.e25>
- Le, H., Perry, D., & Sheng, X. (2009). Using the internet to screen for postpartum depression. *Maternal and Child Health Journal*, 13(2), 213–221. <https://doi.org/10.1007/s10995-008-0322-8>



- Learman, L. A. (2018). Screening for Depression in Pregnancy and the Postpartum Period. *Clinical Obstetrics and Gynecology*, *61*(3), 525–532.  
<https://doi.org/10.1097/GRF.0000000000000359>
- Lee, E., Denison, F., Hor, K., & Reynolds, R. (2016). Web-based Interventions for Prevention and Treatment of Perinatal Mood Disorders: A Systematic Review. *BMC Pregnancy and Childbirth*, *16*(1), 1–8. <https://doi.org/10.1186/S12884-016-0831-1>
- Li, C. H. (2016). Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. *Behavior Research Methods*, *48*(3), 936–949. <https://doi.org/10.3758/s13428-015-0619-7>
- Logsdon, M. C., Vogt, K., Davis, D. W., Myers, J., Hogan, F., Eckert, D., & Masterson, K. (2018). Screening for Postpartum Depression by Hospital-Based Perinatal Nurses. *MCN. The American Journal of Maternal Child Nursing*, *43*(6), 324–329.  
<https://doi.org/10.1097/NMC.0000000000000470>
- Martínez-Borba, V., Suso-Ribera, C., & Osma, J. (2018). The Use of Information and Communication Technologies in Perinatal Depression Screening: A Systematic Review. *Cyberpsychology, Behavior and Social Networking*, *21*(12), 741–752.  
<https://doi.org/10.1089/cyber.2018.0416>
- Milgrom, J., Danaher, B. G., Gemmill, A. W., Holt, C., Holt, C. J., Seeley, J. R., ... Ericksen, J. (2016). Internet Cognitive Behavioral Therapy for Women With Postnatal Depression: A Randomized Controlled Trial of MumMoodBooster. *Journal of Medical Internet Research*, *18*(3), e54. <https://doi.org/10.2196/jmir.4993>
- Morales, P. (2008). *La fiabilidad de los tests y escalas. Estadística aplicada a las Ciencias Sociales*. Madrid: Universidad Pontificia Comillas.
- Musser, A. K., Ahmed, A. H., Foli, K. J., & Coddington, J. A. (2013). Paternal Postpartum Depression: What Health Care Providers Should Know. *Journal of Pediatric Health Care*, *27*(6), 479–485. <https://doi.org/10.1016/j.pedhc.2012.10.001>
- Muthén & Muthén. (2011). *MPlus for windows, Version 6.12*. Los ángeles, CA: Muthén & Muthén.
- Naslund, J. A., Aschbrenner, K. A., Araya, R., Marsch, L. A., Unützer, J., Patel, V., & Bartels, S. J. (2017). Digital technology for treating and preventing mental disorders in low-income and middle-income countries: a narrative review of the literature. *The Lancet Psychiatry*, *4*(6), 486–500. [https://doi.org/10.1016/S2215-0366\(17\)30096-2](https://doi.org/10.1016/S2215-0366(17)30096-2)

- Noyman-Veksler, G., Herishanu-Gilutz, S., Kofman, O., Holchberg, G., & Shahar, G. (2015). Post-natal psychopathology and bonding with the infant among first-time mothers undergoing a caesarian section and vaginal delivery: Sense of coherence and social support as moderators. *Psychology and Health, 30*(4), 441–455.  
<https://doi.org/10.1080/08870446.2014.977281>
- O'Hara, M. W., & Wisner, K. L. (2014). Perinatal mental illness: Definition, description and aetiology. *Best Practice and Research: Clinical Obstetrics and Gynaecology, 28*(1), 3–12.  
<https://doi.org/10.1016/j.bpobgyn.2013.09.002>
- Osma, J., Sprenger, M., & Mettler, T. (2017). Introduction of e-mental health in national health systems- A health professionals' perspective. *Health Policy and Technology, 6*, 436–445.
- Osma, J., Barrera, A. Z., & Ramphos, E. (2016). Are Pregnant and Postpartum Women Interested in Health-Related Apps? Implications for the Prevention of Perinatal Depression. *Cyberpsychology, Behavior and Social Networking, 19*(6), 412–415.  
<https://doi.org/10.1089/cyber.2015.0549>
- Pace, C., Spittle, A. J., Molesworth, C. M. L., Lee, K. J., Northam, E. A., Cheong, J. L. Y., ... Anderson, P. J. (2016). Evolution of depression and anxiety symptoms in parents of very preterm infants during the newborn period. *JAMA Pediatrics, 170*(9), 863–870.  
<https://doi.org/10.1001/jamapediatrics.2016.0810>
- Patel, S., & Saunders, K. E. A. (2018). Apps and wearables in the monitoring of mental health disorders. *British Journal of Hospital Medicine, 79*(12), 672–675.  
<https://doi.org/10.12968/hmed.2018.79.12.672>
- Pimenta, F., Albergaria, R., Marôco, J., Leal, I., Chedraui, P., & Pérez-López, F. R. (2019). Validation of the 10-item Cervantes Scale in middle-aged Portuguese women: Paper-and-pencil and online format assessment of menopause-related symptoms. *Menopause, 26*(2), 203–210. <https://doi.org/10.1097/GME.0000000000001180>
- Radoš, S. N., Tadinac, M., & Herman, R. (2018). Anxiety during pregnancy and postpartum: Course, predictors and comorbidity with postpartum depression. *Acta Clinica Croatica, 57*(1), 39–51. <https://doi.org/10.20471/acc.2018.57.01.05>
- Ranson, K. E., & Urichuk, L. J. (2008). The effect of parent-child attachment relationships on child biopsychosocial outcomes: A review. *Early Child Development and Care, 178*(2), 129–152. <https://doi.org/10.1080/03004430600685282>
- 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>
- Roman, M., Constantin, T., & Bostan, C. M. (2020). The efficiency of online cognitive-behavioral therapy for postpartum depressive symptomatology: a systematic review and meta-analysis. *Women & Health*, 60(1), 99–112. <https://doi.org/10.1080/03630242.2019.1610824>
- Sardi, L., Idri, A., & Fernández-Alemán, J. L. (2017). A systematic review of gamification in e-Health. *Journal of Biomedical Informatics*, 71, 31–48. <https://doi.org/10.1016/j.jbi.2017.05.011>
- Shorey, S., Chee, C. Y. I., Ng, E. D., Lau, Y., Dennis, C. L., & Chan, Y. H. (2019). Evaluation of a technology-based peer-support intervention program for preventing postnatal depression (Part 1): Randomized controlled trial. *Journal of Medical Internet Research*, 21(8), e12410. <https://doi.org/10.2196/12410>
- Sprenger, M., Mettler, T., & Osma, J. (2017). Health professionals' perspective on the promotion of e-mental health apps in the context of maternal depression. *PloS One*, 12(7), e0180867. <https://doi.org/10.1371/journal.pone.0180867>
- Tan, W., Hao, F., McIntyre, R. S., Jiang, L., Jiang, X., Zhang, L., ... Tam, W. (2020). Is returning to work during the COVID-19 pandemic stressful? A study on immediate mental health status and psychoneuroimmunity prevention measures of Chinese workforce. *Brain, Behavior, and Immunity*, 87, 84–92. <https://doi.org/10.1016/j.bbi.2020.04.055>
- Tolja, R., Nakić Radoš, S., & Anđelinović, M. (2020a). The role of maternal mental health, infant temperament, and couple's relationship quality for mother-infant bonding. *Journal of Reproductive and Infant Psychology*, 38(4), 395–407. <https://doi.org/10.1080/02646838.2020.1733503>
- Tsuchida, A., Hamazaki, K., Matsumura, K., Miura, K., Kasamatsu, H., Inadera, H., ... Katoh, T. (2019). Changes in the association between postpartum depression and mother-infant bonding by parity: Longitudinal results from the Japan Environment and Children's Study. *Journal of Psychiatric Research*, 110, 110–116. <https://doi.org/10.1016/j.jpsychires.2018.11.022>
- Vallejo, M. A., Jordán, C. M., Díaz, M. I., Comeche, M. I., & Ortega, J. (2007). Psychological assessment via the internet: A reliability and validity study of online (vs paper-and-pencil) versions of the General Health Questionnaire-28 (GHQ-28) and the Symptoms Checklist-90-Revised (SCL-90-R). *Journal of Medical Internet Research*, 9(1), e2.

<https://doi.org/10.2196/jmir.9.1.e2>

Vispoel, W. P., Boo, J., & Bleiler, T. (2001). Computerized and paper-and-pencil versions of the Rosenberg self-esteem scale: A comparison of psychometric features and respondent preferences. *Educational and Psychological Measurement*, *61*(3), 461–474.

<https://doi.org/10.1177/00131640121971329>

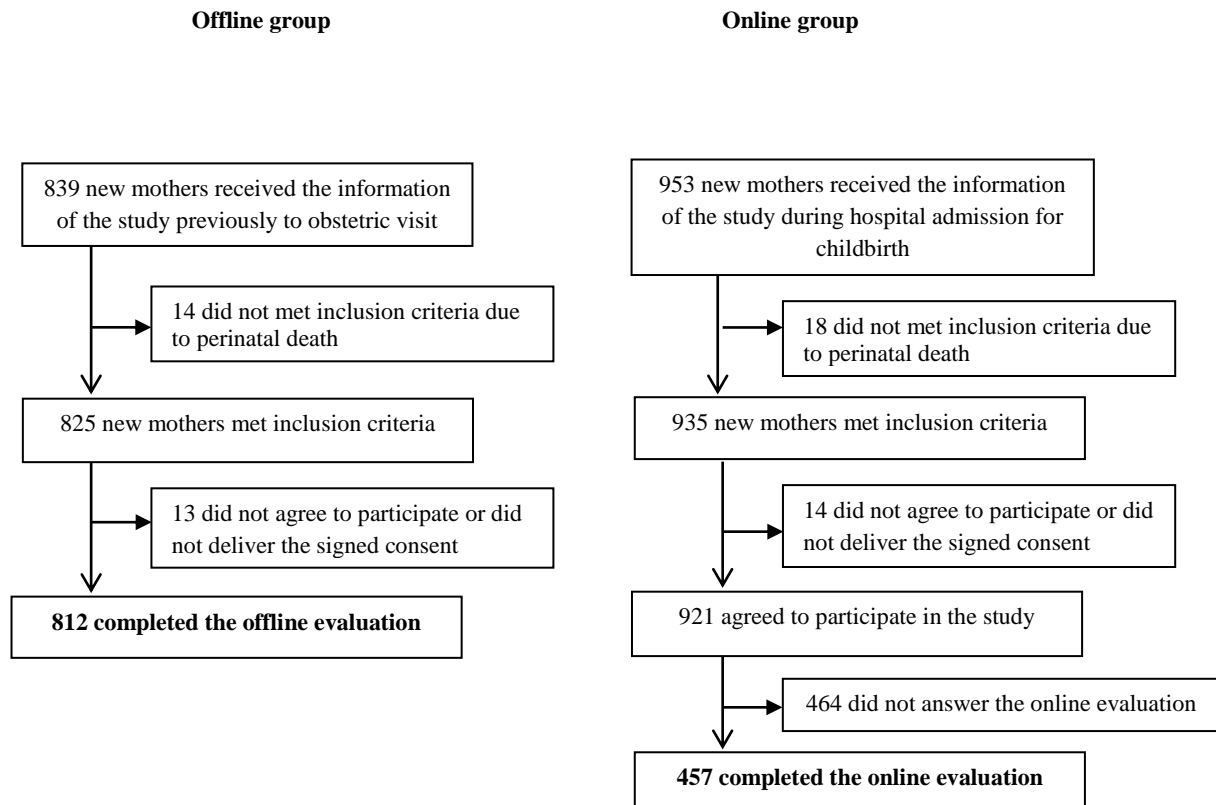
Vleeschouwer, M., Schubart, C. D., Henquet, C., Myin-Germeys, I., Van Gastel, W. A., Hillegers, M. H. J., ... Derks, E. M. (2014). Does assessment type matter? A measurement invariance analysis of online and paper and pencil assessment of the Community Assessment of Psychic Experiences (CAPE). *PLoS ONE*, *9*(1), e84011.

<https://doi.org/10.1371/journal.pone.0084011>

Yoshida, T., Matsumura, K., Tsuchida, A., Hamazaki, K., & Inadera, H. (2020). Influence of parity and mode of delivery on mother–infant bonding: The Japan Environment and Children’s Study. *Journal of Affective Disorders*, *263*, 516–520.

<https://doi.org/10.1016/j.jad.2019.11.005>

**Fig 1. Flow chart of the study**



**Table 1**

Comparison between completers and non-completers in offline sample (n=812) in sociodemographic, reproductive, obstetric and psychological variables

Variable	Completers (n=142)	Non-completers (n=670)	Comparison	
	Frequency (%)	Frequency (%)	$\chi^2$	<i>p</i>
<b>Academic level</b>	142	24		
< 12 years	30 (21.1)	6 (25)	0.18	.668
> 12 years	112 (78.9)	18 (75)		
<b>Employment</b>	142	25		
Employed	127 (89.4)	22 (88)	0.04	.834
Unemployed	15 (10.6)	3 (12)		
<b>Reproduction</b>	142	553		
Natural	111 (78.2)	475 (85.9)	5.06	.024
Assisted reproduction	31 (21.8)	78 (14.1)		
<b>Delivery</b>	142	621		
Vaginal	93 (65.5)	451 (72.6)	2.84	.092
Cesarean	49 (34.5)	170 (27.4)		
<b>Infant feeding</b>	142	668		
Breastfeeding	70 (49.3)	370 (55.6)	1.87	.172
Mixed/infant formula	72 (50.7)	298 (44.6)		
<b>Parity</b>	142	665		
Primiparous	74 (52.1)	370 (55.6)	0.58	.447
Multiparous	68 (47.9)	295 (44.4)		
<b>Anxiety/depression lifetime</b>	142	668		
Yes	40 (28.2)	211 (31.6)	0.63	.427
No	102 (71.8)	457 (68.4)		
<b>Anxiety/depression pregnancy</b>	142	665		
Yes	17 (12)	80 (12)	<.001	.985
No	125 (88)	585 (88)		
<b>Stress pregnancy/ postpartum</b>	142	667		
Yes	35 (24.6)	163 (24.4)	0.01	.960
No	107 (75.4)	504 (75.6)		
	<b>Mean (SD; range)</b> <b>(n=142)</b>	<b>Mean (SD; range)</b> <b>(n=670)</b>	<i>t</i>	<i>p</i>
Age	34.99 (4.44; 23-48)	34.72 (4.24; 23-50)	-0.69	.493
EPDS	4.83 (4.09; 0-18)	4.93 (3.83; 0-26)	0.27	.789
PBQ total score	8.67 (7.07; 0-37)	8.93 (7.31; 0-47)	0.39	.694
PBQ Impaired bonding	4.76 (3.82; 0-19)	4.75 (3.93; 0-23)	-0.02	.982
PBQ Rejection and anger	0.94 (1.80; 0-8)	1.01 (1.87; 0-10)	0.42	.678
PBQ Anxiety about infant	2.92 (2.43; 0-13)	3.11 (2.48; 0-14)	0.87	.386
PBQ Incipient abuse	0.05 (0.25; 0-2)	0.05 (0.32; 0-4)	0.15	.878

$\chi^2$ : Chi-Squared test; SD: Standard deviation; EPDS: Edinburgh Postnatal Depression Scale; PBQ: Postpartum Bonding Questionnaire.

**Table 2***Differences between offline and online sample in sociodemographic, reproductive and obstetric outcomes*

Variable	Offline		Online		Comparison		
	N	Mean (SD; range)	N	Mean (SD; range)	<i>t</i>	df	<i>p</i>
Age	811	34.77 (4.27; 23-50)	457	34.98 (3.98; 22-47)	-0.86	1266	.388
	N	Frequency (%)	N	Frequency (%)	$\chi^2$		<i>p</i>
<b>Academic level</b>	166		457				
< 12 years		36 (21.7)		53 (11.6)		10.12	<b>.001</b>
> 12 years		130 (78.3)		404 (88.4)			
<b>Employment</b>	167		457				
Working		149 (89.2)		407 (89.1)		0.01	.954
Unemployed		18 (10.8)		50 (10.9)			
<b>Reproduction</b>	695		457				
Natural		586 (84.3)		350 (76.6)		10.81	<b>.001</b>
Assisted reproduction		109 (15.7)		107 (23.4)			
<b>Delivery</b>	763		457				
Vaginal		544 (71.3)		289 (63.2)		8.57	<b>.003</b>
Cesarean		219 (28.7)		168 (36.8)			
<b>Infant feeding</b>	810		457				
Breastfeeding		440 (54.3)		250 (54.7)		0.02	.895
Mixed/infant formula		370 (45.7)		2.7 (45.3)			
<b>Parity</b>	807		457				
Primiparous		444 (55.0)		289 (63.2)		8.09	<b>.004</b>
Multiparous		363 (45.0)		168 (36.8)			

 $\chi^2$ : Chi-Squared test; SD: Standard deviation

**Table 3***Differences between offline and online samples in psychological variables and clinical outcomes*

Variable	Offline		Online		Comparison		
	N	Frequency (%)	N	Frequency (%)	$\chi^2$	<i>p</i>	
<b>Anxiety/depression lifetime</b>	810		457				
Yes		251 (31)		170 (37.2)	5.31	.024	
No		559 (69)		287 (62.8)			
<b>Anxiety/depression pregnancy</b>	807		457				
Yes		97 (12)		68 (14.9)	2.10	.147	
No		710 (88)		389 (85.1)			
<b>Stress pregnancy/postpartum</b>	809		457				
Yes		198 (24.5)		158 (34.6)	14.73	<.001	
No		611 (75.5)		299 (65.4)			
	<b>N</b>	<b>Mean (SD; range)</b>	<b>N</b>	<b>Mean (SD; range)</b>	<b><i>t</i></b>	<b>df</b>	<b><i>p</i></b>
EPDS	812	4.91 (3.88; 0-26)	457	6.34 (4.53; 0-26)	-5.92	1267	<.001
PBQ total score	812	8.89 (7.26; 0-47)	457	11.13 (9.45; 0-67)	-4.73	1267	<.001
PBQ Impaired bonding	812	4.75 (3.91; 0-23)	457	5.79 (5.04; 0-37)	-4.07	1267	<.001
PBQ Rejection and anger	812	1 (1.85; 0-12)	457	1.71 (2.72; 0-18)	-5.52	1267	<.001
PBQ Anxiety about infant	812	30.8 (2.47; 0-14)	457	3.54 (2.58; 0-15)	-3.12	1267	.002
PBQ Incipient abuse	812	0.05 (0.31; 0-4)	457	0.09 (0.35; 0-2)	-2.17	1267	.031

 *$\chi^2$ : Chi-Squared test; SD: Standard deviation; EPDS: Edinburgh Postnatal Depression Scale; PBQ: Postpartum Bonding Questionnaire.*



**Table 4**

*Associations between bonding and demographic, obstetric and psychological variables in the offline and online sample*

Variable	PBQ total score					
	Offline			Online		
	N	<i>r</i>	<i>p</i>	N	<i>r</i>	<i>p</i>
Age	811	.01	.992	457	-.08	.108
Education level	166	-.07	.395	457	.02	.676
Employment	167	-.06	.459	457	-.02	.712
Reproduction	695	-.02	.603	457	-.04	.419
Delivery	763	.05	.205	457	-.01	.899
Infant feeding	810	.03	.477	457	-.01	.950
Parity	807	-.12	<b>&lt;.001</b>	457	-.03	.536
Anxiety/depression lifetime	810	.12	<b>&lt;.001</b>	457	.14	<b>.002</b>
Anxiety/depression pregnancy	807	.12	<b>&lt;.001</b>	457	.22	<b>&lt;.001</b>
Stress pregnancy/postpartum	809	.13	<b>&lt;.001</b>	457	.17	<b>&lt;.001</b>
EPDS	812	.50	<b>&lt;.001</b>	457	.58	<b>&lt;.001</b>

*PBQ: Postpartum Bonding Questionnaire; EPDS: Edinburgh Postnatal Depression Scale*