

Infant-direct speech and mother-infant attention in depressed and nondepressed mothers.

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ABSTRACT

Postpartum depression (PPD) is associated with disturbances in mother-infant interaction. We compared the content of the infant-directed speech (IDS), the expression of positive affection in the maternal voice and the attentional engagement in dyads of PPD and non-PPD mothers. The participants of this study were 80 mothers and their infants at 3-6 months; 40 mothers presented PPD. The dyads were videotaped during free play interactions. No significant differences were found between the groups in any of these categories. A linear regression analysis indicated that the mother's years of education were a predictive factor for the quality of the interaction only for PPD mothers. PPD influenced mother-infant interaction when associated with maternal sociodemographic characteristics.

Keywords: infant direct speech; mother-infant attention; postpartum depression.

RESUMO

Discurso direcionado à criança e atenção mãe-criança em mães com e sem depressão pós-parto.

A depressão pós-parto (DPP) está associada a distúrbios na interação mãe-bebê. Nós comparamos o conteúdo do discurso direcionado à criança, a expressão de afeto positivo e o engajamento em episódios de atenção em díades de mães com e sem DPP. Participaram deste estudo 80 mães e seus bebês entre 3-6 meses; quarenta mães foram consideradas deprimidas. As díades foram filmadas durante interação livre. Não foram encontradas diferenças significativas entre os grupos em nenhuma dessas categorias. Uma análise de regressão linear indicou que os anos de escolaridade da mãe foram um fator preditivo para a qualidade da interação apenas para as mães com DPP. A DPP influenciou a interação mãe-bebê quando associada a características sociodemográficas maternas.

Palavras-chave: discurso direcionado à criança; atenção mãe-criança; depressão pós-parto.

Postpartum Depression (PPD) is a mental disorder that happens to mothers in the first three weeks after childbirth. Ten to twenty percent of new mothers experience clinically significant depression (Howard et al., 2014; Wisner et al., 2013). PPD is characterized by the whole spectrum of depressive symptoms that may be more chronic and persist beyond

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12 months postpartum (Klier et al. 2008; Netsi et al., 2018), and a significant factor in the duration of symptoms is the length of delay to adequate treatment (England et al., 1994). The prevalence rates vary according to the clinic of depression and a range of sociodemographic and psychosocial factors such as previous episodes of depression, low socioeconomic status, lack of social support, marital problems, low levels of education, and stressful life events (Alvarenga et al., 2013; Moraes et al., 2015; Silverman et al., 2017).

PPD is associated with mother-infant interaction disturbances, maternal intrusive interaction, less responsive caregiving, poor stimulation, and a range of problematic developmental outcomes for the child (Alvarenga & Palma, 2013; Goodman et al., 2017; Kheirabadi et al., 2017). The influence of PPD on child development may vary with chronicity and presence of other risk factors (Egmore et al., 2018; Humphreys et al., 2018; Perra et al., 2015; Quevedo et al., 2012), and these adverse effects can persist even if remission of maternal depression occurs (Murray et al., 1993).

Despite the risks, maternal depression does not culminate deterministically in adverse developmental outcomes. Children have shown evidence of a positive development, including, for example, secure attachment to their depressed mothers (DeMulder & Radke-Yarrow, 1991), similar results over children of non-PPD mothers in language task (Moraes et al., 2013), and in cortisol levels (Lucci et al., 2016). Studies also indicate that depressive symptoms do not necessarily cause impairments in mother-infant interaction (Defelipe et al., 2017; Fonseca et al., 2010).

INFANT-DIRECTED SPEECH AND MOTHER-INFANT ATTENTION

Infant-directed speech (IDS), also known as motherese, has a universal biological component and is part of the intuitive parental program (Papoušek, 2007). It is characterized by higher tones, frequent repetition, prolongation of vowel sound, and exaggerated acoustics that arouses the baby's interest in interaction (Dilley et al., 2014; Fernald, 1985; Song et al., 2010). IDS emerges in a vocal context of emotion expression and is considered an important factor to emotional bond (Saint-Georges et al., 2013).

PPD reduces IDS quantity (Saint-Georges et al., 2013) and quality (Kaplan et al., 2001). Studies have shown that

the IDS of depressed mothers is self-focused, contains a high percentage of negative affection, few references to child agency (Herrera et al., 2004; Murray et al., 1993) and is associated with psychological distancing (Humphreys et al., 2018).

The content of the IDS seems to be associated with later child development. Murray et al. (1993) showed that a child-centered IDS at four months was associated with better performance on language-related tasks when the child was 18 months. Allely et al. (2013) found that low frequencies of IDS when infants were one year old predicted a psychiatric

diagnostic at seven. The study conducted by Perra et al. (2015) revealed that an IDS more focused on infants thoughts and feelings fostered later development of imitation.

Attentional engagement processes and IDS are integrated elements of mother-infant interaction that coexist during early infancy. IDS arouses, attracts and maintains infants' attention (Saint Georges et al., 2013). During IDS, infants gaze into the eyes of the partner in a mutual gazing activity, in which the infant is not monitoring the adult's looking at her or at any other object, but is in a direct engagement (Tomasello et al., 2005).

PPD mothers are less attentive to their children, less able to coordinate a focus of attention during interaction (Goldsmith & Rogoff, 1997), show deficits in mutual attentiveness (Field et al., 1989), initiate less frequently a focus of attention (Jameson et al., 1999), and fail in maintaining their babies' attention in a toy (Schwengber & Piccinini, 2004).

Despite the importance of understanding the influence of PPD on maternal care behavior and on the quality of mother-infant interaction, there are no studies that address the IDS content associated with positive affection expression and mother-infant attentional engagement in the context of PPD. Previous findings show that depressed mothers have disturbances in these aspects of interaction with their babies. Therefore, the objective of the present study was to investigate the content of the IDS, the expression of positive affection and the mother-infant attention in dyads of PPD and non-PPD mothers.

Our hypotheses were that PPD mothers would talk less to their babies and would present a self-focused speech with few references to the child's agency and lower expression

of positive affection. We also expected that PPD

mothers would present lower behaviors of attentional engagement.

Considering that low socioeconomic status is a predictor of PPD (Moraes et al., 2015) and, consequently, a potential influence on the mother-child interaction, we also investigated if the maternal sociodemographic data (age, years of education, number of children and marital status) would predict the quality of mother-infant interaction.

This study is part of a larger four-year longitudinal study called "Postpartum depression as a risk factor for infant development: an interdisciplinary study of factors involved in the genesis of the episode and its consequences", known as Projeto Ipê, conducted at University of São Paulo (USP), Brazil and funded by São Paulo Research Foundation (FAPESP). In this project, low-income mothers were followed from the third trimester of their pregnancy up to their child's third birthday. For the purposes of this study, only the data extracted at 3-6 months were analyzed.

METHOD

PARTICIPANTS

The participants were 80 mothers recruited by research assistants in the university hospital and health centers in São Paulo to take part in the longitudinal project. They were evaluated during seven periods of the pre and postnatal life: third trimester of pregnancy, 24-48 hours after birth, 3-6, 8, 12, 24, and 36 months. The Edinburgh Postnatal Depression Scale (EPDS) was used to evaluate mothers' depression symptoms. Based on this measure, two groups were created: depressed mothers ($n = 40$) and nondepressed ones ($n = 40$).

Babies were 18 boys and 22 girls in each group, at 3-6 months old. This is the period of higher incidence of depressive disorders (Cox et al., 1993) and is considered the beginning of the primary intersubjectivity (up to nine months), appropriate to evaluate child engagement in face-to-face interactions (Trevarthen & Aitken, 2001).

All mothers had pregnancy and childbirth without complications and the babies were considered healthy by the medical staff of the University Hospital (HU) of USP. Treatment was offered to the depressed mothers.

The average EPDS scores were 5.5 ($SD = 3.6$; *range*

= 0-11) for non-PPD mothers and 17.5 ($SD = 4.0$; *range* = 12-26) for PPD ones. Mothers averaged 26.2 years old ($SD = 5.7$; *range* = 16-40) and the babies, 18 weeks ($SD = 2.4$; *range* = 12.5-24.7). Sixty four percent were primiparous and 36% had 2-4 children (including the newborn). Eighty one percent were living with the father of the child. Based on data such as the level of education - which in Brazil is strongly associated with income - the place of residence and housing conditions, it was considered that mothers had mostly low income.

INSTRUMENTS

EPDS: At three months after delivery (Cox et al., 1987) EPDS was used to assess postpartum depressive mood. This scale was validated in Brazil by Santos et al. (1999), and is an instrument of self-assessment which consists of ten self-report items that evaluate the presence or intensity of symptoms such as depressed mood, feelings of incompetence to deal with the child, sleep disturbance, loss of pleasure, ideas of death and suicide, decreased performance, and guilt. The scale is considered a screening instrument to indicate the occurrence of depression symptoms and not to perform a diagnosis of depression, and was applied between the 9th and 12th weeks after childbirth. Mothers scoring below 12 were classified as non-PPD, and those scoring 12 or above it as PPD. This cut-off point was suggested by Santos et al. (1999) in their validation study.

PROCEDURES

The longitudinal project was approved by the Research Ethics Committee board of the HU-USP (CEP-HU/USP: 673/06 - SISNEP CAAE: 0051.0.198.000-06), and the Human Subjects Committee of the IPUSP (Of.0806/CEPH-04/07/06). All participants were informed about the objectives of the study and signed a Term of Informed Consent.

Mothers and their babies were videotaped during free play interactions. The dyads were seated in a standard face-to-face setup, with the baby placed in an infant seat in front of the mother, at a distance of 60cm from each other. A basket with toys was available. The mothers were instructed to interact freely with their babies as if they would be at home. A 25x optical zoom digital camcorder with attached mirror was installed at a distance of approximately 1 meter from the dyad. Each dyad was filmed during a single ten-minute session.

The video analyses were conducted on the software Interact Mangold 8.0. The videos were divided into 5-second intervals for a more accurate identification of IDS, which is characterized by short sentences. Each video had 120 intervals, 9600 in total. 259 intervals were classified as non-audible for technical problems in the videos and were not coded. Then, we had 9341 coded intervals, on average 116.7 ($SD = 3.6$; $range = 99-120$) per mother. In order to correct this difference in the duration of the videos, the frequencies of each category were calculated proportionally to the number of coded intervals.

The coding unit was the utterance, defined as each excerpt of the discourse marked by a perceptible pause or intonation, regardless of whether it is a complete sentence or not (Bornstein et al., 1992; Pessôa et al., 1998). So, the minimum unit size could be a single word,

for example: "baby!".

For every 5- seconds interval we coded: (1) - if the mother talked to the baby (verbalization); (2) - the content of the IDS; (3) - if the IDS expressed positive affection; and (4) - whether the dyad was engaged in mutual or in shared attention during IDS.

This coding system scheme was developed by the first author for the present study and adopts a micro-analytic approach of the IDS, associated with mutual attention engagement (Santos, Santos, & Bussab, in press). These observational measures taken together provide a unique perspective on IDS content, with detailed categories and, mother-infant attention related to the IDS and the affectionate speech. Table 1 contains the definitions of the categories.

Table 1: Definitions of IDS Content Categories, Positive Affection and Attentional Engagement Behaviors

Category	Definition
IDS content (Keller, 2007; Murray et al, 1993)	
Agency	The mother refers to the baby as having intentions, volitions, cognitions, emotions, preferences, or decisions.
Address	The mother is addressing the child in an affectionate or functional (e.g., son) manner. Includes call by the name and nicknames.
Co-agency	The mother refers to the child as acting together with somebody else (mostly the mother herself).
Driving attention	Call the baby's attention to herself or to elements of the context.
Self-referral	The mother refers to herself as the speaking person or to her own experiences.
Positive affection (Bornstein et al, 1992)	An expressive, soft and sweet voice. Generally, no propositional, with meaningless statements that included greetings, rhymes and endearments.
Attentional engagement behaviors (Tomasello et al., 2005; Tomasello, 1995).	
Mutual attention	A face-to-face visual engagement in which mother and baby are mutually responsive, mainly through the expression of emotions and behavioral turn taking.
Shared attention	The dyad stares simultaneously at the same object.

Interobserver reliability was calculated on a random sample of 20 mothers. Videotapes were coded by an independent observer blind to group assignment and to the hypothesis of the study. Cohen's kappa index varied from substantial (0.62) to excellent (0.88).

DATA ANALYSIS

The analyses were performed using the program Statistical Package for Social Sciences (SPSS) version 22.0. First, descriptive analyses were performed. Second, the groups' averages for IDS, attentional engagement, and positive affect categories were compared using the *t*-test. To determine the association between the IDS content and the mother-infant attentional engagement behaviours, Pearson Correlation Test was used.

The categories with stronger and significant associations were aggregated, by adding the frequency of each category and averaging these values. A score

was created for each mother. Two variables were created, corresponding to two sets of interactive behavior, based on Lloyd-Fox et al. (2015) description of optimal mother-infant interaction. Then, we ran a linear regression to investigate which sociodemographic data predicted the dyad's performance in these two interactional styles. For the analyzes, a confidence interval of 95% and a significance level of 5% were adopted.

RESULTS

The total of utterances was 12.468 in 778 minutes of interaction, 6514 utterances for non-PPD mothers (16 utterances per minute) and 5954 utterances for PPD ones (15 utterances per minute). There was no significant difference between the groups for the averages of the IDS content categories, as well as for positive affection and attentional engagement behavior. The categories of discourse with the highest averages were the same for the both (table 2).

Table 2: Means (M) and Standard Deviation (SD) of Categories According to PPD Status

Category	Non-PPD M/SD	PPD M/SD
Agency	0.42 (0.27)	0.36 (0.16)
Driving attention	0.30 (0.15)	0.29 (0.14)
Address	0.21 (0.13)	0.22 (0.14)
Self-referral	0.02 (0.04)	0.02 (0.04)
Co-agency	0.02 (0.02)	0.01 (0.02)
Positive affection	0.56 (0.31)	0.49 (0.31)
Mutual attention	0.22 (0.17)	0.24 (0.18)
Shared attention	0.35 (0.23)	0.42 (0.23)

Results indicated that the categories with significant and higher associations were: verbalization, agency,

positive affect, dyadic attention, and shared attention (Table 3).

Table 3: Pearson Correlation Coefficients Between the Categories of the Interactive Scores

Categories	1	2	3	4	5
1. Verbalization	1	0.68	0.72	0.42	0.38
2. Agency	0.68	1	0.62	0.34	0.30
3. Positive affection	0.72	0.62	1	0.46	0.54
4. Mutual attention	0.42	0.34	0.72	1	-
5. Shared attention	0.38	0.30	0.54	-	1

Note: $p < 0.05$; the categories 4 and 5 are mutually exclusive, given that we consider that these behaviors cannot happen simultaneously.

Two data sets were of interactive behaviors created, based on these categories (as mentioned in *data analysis*). The first, which we will call “maternal interaction style 1,” includes the categories of maternal verbal behaviors: verbalization, agency, and positive affection. The second one, “maternal interaction style 2”, includes the categories of interactive score 1, plus the attentional engagement behaviors.

The averages of the interactive scores 1 were: non-PPD group ($M = 0.57$; $SD = 0.23$; $range = 0.17-1.08$) and PPD group ($M = 0.52$; $SD = 0.19$; $range = 0.12-0.84$). For the interactive score 2 the values were: non-PPD group ($M = 0.46$; $SD = 0.18$; $range = 0.21-0.92$) and PPD group ($M = 0.44$; $SD = 0.16$; $range = 0.16-0.83$). A linear regression analysis indicated among the four investigated predictors; only years of education was significant, but just for depressed mothers, for the occurrence of both interactive scores: 1 ($R^2 = 0.32$; $F = 4.00$; $DF=1$; $p = .047$) and 2 ($R^2 = 0.36$; $F = 5.00$; $DF = 1$; $p = .028$).

DISCUSSION

Contrary to our hypothesis, PPD did not influence the IDS content and positive affection expression. Our findings do not support prior research that indicates a negative modification of the functional content of the maternal discourse and a higher incidence of negative affect expression for PPD mothers (Herrera et al., 2004; Murray et al., 1993).

The order of appearance of the IDS categories in terms of average values was the same for the groups. Agency was the most frequent category. This result is consistent

with Murray et al. (1993) study about IDS of PPD and non-PPD mothers. We believe that mothers intuitively adjust the IDS content according to the age of the baby (Bornstein et al., 1992), and when mothers refer to the baby’s agency they are assigning to the child capacities that are to be developed. So, it is expected that mothers stimulate the babies referring to their agency during IDS.

Driving attention was the second most frequent IDS category, which is also expected for this developmental stage in which the interactions are especially face to face, and mothers establish a form of communication in which she catches the child’s attention for mutual engagement. Address expresses an affectionate way of addressing the baby. We believe that the slightly higher average for non-PPD mothers is probably because they address their children more frequently in order to attract their attention, which may be disturbed as a result of some interaction disruption due to maternal depression. According to Imafuku et al. (2014) calling the child’s name causes responses of the babies’ prefrontal cortex, a process that must be involved in attracting attention.

The similarity of the maternal discourse style between groups indicates that depressed mothers somehow can establish an appropriate interactive pattern with their children. There seems to be an effort to establish a connection with the baby. Raag et al. (1997) found that depressed mothers are able to compensate for their depressive behavior when interacting with their infants; they interacted in more positive ways when reminded about their depressive symptoms before the interaction. Hence, it could be that the depressed mothers in our sample

were more aware of their symptomatology due to the

laboratory visit and thus were able to compensate for their depression.

The hypothesis that depressed mothers would have a more self-focused discourse, with higher scores in self-reference category and lower in coagency was not supported. Depressive symptoms is usually associated with greater use of "I" over "we" in mother's narratives, reflecting increased self-focus and psychological distancing, as identified by Humphreys et al. (2018).

Contrary to our expectations, mutual and shared attention was not affected by PPD. This result is consistent with Schwengber and Piccinini (2004) study that found no differences in attentional process between PPD and non-PPD mothers, but not with studies that report disturbances in mother-infant attentional engagement in PPD context (Field et al., 1989; Goldsmith & Rogoff, 1997; Jameson et al., 1999).

Studies have shown that the differences between the interaction of dyads of PPD and non-PPD mothers-infants emerge on more subtle aspects than on large scale characteristics. This can be detected on findings of other studies from our longitudinal project. For example, depressed and nondepressed mothers looked, touched and smiled at their babies with the same intensity, but the babies of depressed mothers vocalized less during interaction with their mothers (Defelipe et al., 2017), and in spite of developmental delay in infants of PPD mothers, they showed better results in some items of a developmental scale (Moraes et al., 2013).

However, our results indicated the influence of PPD associated with years of education in the interactional scores 1 and 2. The association of IDS, positive affection and attentional engagement seems to be an optimal interactional style that increases the baby's brain activity (Lloyd-Fox et al., 2015).

We believe that isolated aspects of IDS and attentional engagement may not be directly affected by maternal depression, but PPD symptoms can influence the interaction when these elements are in conjunction. Our results show that depression itself did not influence the interaction with the baby, but the combination with other factors, for example, years of education.

Finally, it is important to emphasize that the mother's years of education function as a protective factor for postpartum depression and for the expression of depressive symptoms during interaction with the child, which is further evidence that formal education needs to be encouraged and improved in Brazil. These findings also

reinforce the necessity of considering pregnancy and the puerperium as critical moments for child development, deserving special attention in mental health policies. Furthermore, PPD intervention and prevention programs should consider the recurrence of the depression. Cooper & Murray (1995) observed that mothers with PPD have a greater chance of recurrence of new episodes of PPD than depressive episodes out of the postpartum period.

There are some limitations to this study. The first is one that the dyads were not interacting at home, but in a laboratory setting. Previous research indicates that mothers can interact with their babies differently at home, compared to in a laboratory setting (Jaffe et al., 2001; Lewedag et al., 1994). Second, only a 10-minute interval of each mother-infant interaction was coded. It can be a short time span and may not fully describe the naturalistic interactions of mother and infant. Finally, there was a lack of specific assessment of child behavior. Despite these limitations, this study contributes to the understanding of postpartum depression in the context of low socioeconomic status. Moreover, analyzes associating IDS, expression of affection and mother-baby attention bring new information to the literature.

To conclude, depressed mothers can buffer the depression effects on the relationship with the baby, enabling them to an optimal interaction, depending on the presence of other variables that may attenuate or aggravate the influence of the depressive symptoms. This shows the relevance of analyzing depression related to the mothers' social, economic and emotional conditions. Thus, these findings reinforce the need for more research on PPD in low socioeconomic status population and the need for prevention and treatment programs for these women.

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DECLARAÇÃO DE CONFLITOS DE INTERESSE

Os autores declaram que não há conflitos de interesse no manuscrito submetido

DECLARAÇÃO DA CONTRIBUIÇÃO DOS AUTORES

Certificamos que todos os autores participaram suficientemente do trabalho para tornar pública sua responsabilidade pelo conteúdo. A contribuição de cada autor pode ser atribuída como se segue:

A. K. S. foi administradora do projeto deste estudo; L. S. S. contribuiu na análise formal dos dados e Vera Silvia Raad Bussab foi supervisora desta pesquisa.

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