







# Type of Childbirth and its Association with the Maternal-Filial Interaction

## *Tipo de nascimento e sua associação com a interação materno-filial*

Crystiane Hereny dos Santos Neto<sup>1</sup>  Fábio Sagula Oliveira<sup>2</sup>  Graciele Fernanda Gomes<sup>3</sup>   
Edward Araujo Júnior<sup>1</sup>  Mary Uchiyama Nakamura<sup>1</sup>  Eduardo de Souza<sup>1</sup> 

<sup>1</sup> Department of Obstetrics, Escola Paulista de Medicina, Universidade Federal de São Paulo, São Paulo, SP, Brazil

<sup>2</sup> Centro Universitário de Ourinhos, Ourinhos, SP, Brazil

<sup>3</sup> Santa Casa de Ourinhos, Ourinhos, SP, Brazil

Address for correspondence Edward Araujo Júnior, PhD, Rua Botucatu, 740, Vila Clementino, São Paulo, SP, 04023-061, Brazil (e-mail: araujojred@terra.com.br).

Rev Bras Ginecol Obstet 2020;42(10):597–606.

### Abstract

**Objective** The purpose of the present study was to evaluate the quality of mother-child bonding in three different contexts related to the labor, that is, vaginal delivery, elective cesarean section, and intrapartum cesarean section.

**Methods** This was an observational, cross-sectional clinical study conducted in two cities within the state of São Paulo, Brazil. The study sample consisted of 81 babies born without any major complications during pregnancy and labor, aged 3 to 4 months, and their respective mothers, aged between 20 and 35 years old, primiparous, living in the cities of Palmital and Ourinhos, state of São Paulo, Brazil. The evaluation of the quality of the maternal-filial interaction was performed through video-image analysis, using the Mother-baby Interaction Observation Protocol from 0 to 6 months (POIMB 0–6, in the Portuguese acronym).

**Results** Mothers who had vaginal delivery had higher amount of visual contact or attempted visual contact ( $p = 0.034$ ), better response to the social behavior of the child ( $p = 0.001$ ) and greater sensitivity ( $p = 0.007$ ) than the others. Their children also showed more interaction with them, as they looked more frequently at the mother's face ( $p \leq 0.008$ ) and responded more frequently to the mother's communicative stimulus ( $p < 0.001$ ).

**Conclusion** Considering the occurrence of vaginal delivery, it is concluded that the interaction between the mother-child dyad is quantitatively larger and qualitatively better when compared with intrapartum or elective cesarean section.

### Keywords

- ▶ cesarean section
- ▶ obstetric delivery
- ▶ mother-child relationships
- ▶ vaginal childbirth

### Resumo

**Objetivo** O objetivo do presente estudo foi avaliar a qualidade do vínculo mãe-filho em três contextos diferentes relacionados ao trabalho de parto, ou seja, parto vaginal, cesariana eletiva e cesariana intraparto.

**Métodos** Estudo clínico observacional, transversal, realizado em duas cidades do estado de São Paulo, Brasil. A amostra do estudo foi composta por 81 recém-nascidos

sem maiores complicações durante a gravidez e o parto, com idades entre 3 e 4 meses, e suas respectivas mães, com idades entre 20 e 35 anos, primíparas, residentes nas cidades de Palmital e Ourinhos, estado de São Paulo, Brasil. A avaliação da qualidade da interação materno-filial foi realizada por meio de análise de vídeo-imagem, utilizando o Protocolo de Observação da Interação Mãe-Bebê de 0 a 6 meses (POIMB 0–6).

**Resultados** Mães que tiveram parto vaginal tiveram maior quantidade de contato visual ou tentativa de contato visual ( $p = 0,034$ ), melhor resposta ao comportamento social da criança ( $p = 0,001$ ) e maior sensibilidade ( $p = 0,007$ ) que as demais. Os filhos também mostraram maior interação com elas, pois olhavam com mais frequência para o rosto da mãe ( $p < 0,008$ ) e respondiam com mais frequência ao estímulo comunicativo da mãe ( $p < 0,001$ ).

**Conclusão** Considerando a ocorrência do parto vaginal, conclui-se que a interação entre a díade mãe-filho é quantitativamente maior e qualitativamente melhor quando comparada à cesariana intraparto ou eletiva.

#### Palavras-chave

- ▶ cesariana
- ▶ parto obstétrico
- ▶ relações mãe-filho
- ▶ parto vaginal

## Introduction

The attachment between mother and child corresponds to a basic mechanism of the human being, resulting from the establishment of an affective bond. However, it is modeled according to the characteristics of each relationship, that is, attachment patterns differ qualitatively.<sup>1–3</sup>

Renowned authors of psychoanalysis like Freud and Bowlby, among others, contributed with the scientific knowledge related to the early interactions; however, studies that look at and analyze early parent/infant interactions began to be performed more recently, about ~ 50 years ago. These studies consider the interaction between the mother and the baby as fundamental for the bonding formation and for the good development of the child's psyche.<sup>4,5</sup> The behavior of the child is a response to the maternal behavior that generates the interaction between the dyad; however, the specific characteristics of each individual can generate effective and pleasant relationships, or not.<sup>6</sup>

Studies focused on the analysis of early interaction may be of a qualitative and/or quantitative nature. The choice by the observational method of research allows a thorough analysis of the mother-baby interaction through the recording of actions and sequential events between the dyad.<sup>7,8</sup> The Mother-to-Child Interaction Observation Protocol (POIMB 0–6, in the Portuguese acronym) corresponds to an instrument translated by Alfaya et al<sup>4</sup> that allows the qualitative and quantitative analysis of the interaction between mother and child, based on recorded behaviors. According to Schermann,<sup>9</sup> the POIMB 0–6 corresponds to the only protocol that allows analysis of the interaction between mother and baby since birth.

The POIMB 0–6 has been used in the evaluation of interactions recorded in video, made in different types of pre-established environments, be it domicile or laboratorial, and during the most variable moments of interaction, such as during the baby's bath or during the face-to-face moment between mother and child. Shooting time should also range from 5 to 10 minutes, depending on the situation applied,

and the camera should be positioned at a side angle that favors recording the best image of the participants. All videos should be analyzed by different trained observers (reliability test) and calculated using the Kappa coefficient.<sup>9</sup>

Taking into account the possibility of evaluating the maternal-filial interaction through the making of the video and the subsequent application of the POIMB 0–6 for quantitative analysis of data, it can be affirmed that the application of the protocol makes it possible to compare groups regarding to quality of the interaction.

In this context, we proposed the study of the maternal-filial interaction and its association with the type of birth delivery, based on the application of the POIMB 0–6, utilizing samples from live births in two cities located in the state of São Paulo (a smaller and a medium city related to demographic density).

## Methods

Several instruments and procedures based on different techniques were created with the objective of analyzing the interaction between parents and children. The analysis of interaction through video observation represents an efficient way of studying and recording such interactions. One of the advantages in using videos for the analysis of interactions is the possibility of reviewing the data obtained as many times as necessary. Another advantage is the possibility of analysis by more than one observer. Despite these advantages, the decision to use videos as a form of registration of observations will depend on the objectives and procedures of the research, which should be ethically supported.<sup>1,5,10</sup>

The present study was approved by the Ethics Committee of the Universidade Federal de São Paulo (CAAE: 47395515.6.0000.5505), as of September 30th, 2015. All of the participants signed the Consent Form.

This was an observational and transversal clinical study. The study sample consisted of infants born at term without any major complications during pregnancy and labor, aged 3 to 4 months, and their respective primiparous mothers, aged

between 20 and 35 years old, living in the cities of Palmital and Ourinhos, state of São Paulo, Brazil, consisting of a total of 81 mother-child dyads. This number was calculated, distributing 27 pairs in each group, considering average score of quality, 4, 3 and 2 respectively for groups 1, 2 and 3; 2 was adopted as standard deviation it was adopted 2 as standard deviation, 90% confidence level.

These three distinct groups were composed according the type of delivery: group 1 - vaginal delivery (VD); group 2 - intrapartum cesarean section (ICS), and group 3 - elective cesarean section (ECS). The exclusion criteria were women with twin or multiple gestation history, < 20 or > 35 years old, with psychiatric history and with organic disease, and premature babies, with malformations, syndromes or organic diseases condition.

The evaluation of the quality of the maternal-filial interaction was performed based on video-image analysis, using the POIMB 0–6 translated by Schermann<sup>9</sup> and the application of an objective questionnaire containing gestational data, delivery, puerperium, breastfeeding, as well as socio-demographic data of the family. This protocol is composed by 12 items related to maternal behavior, 8 items related to behavior of the baby and 1 related to the dyad interaction, totalizing 21 items. These items were observed during the moment of the pair interaction, and then, the value of each one was punctuated based on a scale of 5 points. The lowest answer received note 1; and the highest, note 5, for all 21 questions. The videotapes were recorded during the baby's bathing situation, at home environment, and at an average duration of 3 minutes.

To comply with the reliability test and to determine the reliability of the research data, the videotapes were analyzed by 3 observers, 2 of whom were "blinded." One of the observers was the researcher herself (not blind), the other two (blind). One of the blinded observers was a psychologist and a postdoctoral fellow, and the other, a nurse specialist in obstetrics. The camera was hidden to prevent diverting the baby's attention; and it was recommended the mother should behave as naturally/spontaneously as possible.

## Results

The sample calculation was performed to compare the elective cesarean section, intrapartum cesarean section and vaginal delivery groups. For this calculation, the average quality score in the elective cesarean section, intrapartum cesarean section and vaginal delivery groups equal to 2, 3 and 4, respectively, were considered. The global standard deviation (SD) adopted was 2. Considering an  $\alpha$  significance level of 5%, with a total of 81 individuals, 27 for each group, it will be possible to detect, with a power of 90%, a significant difference between the 3 groups.

The first contact with the sample was established at the maternity hospital in the city of Palmital, through semantic visits and active search in the city of Ourinhos. The women who agreed to collaborate with the present study were contacted again at a later time, when the baby was between 3 and 4 months old. During the survey period, 23 mothers did

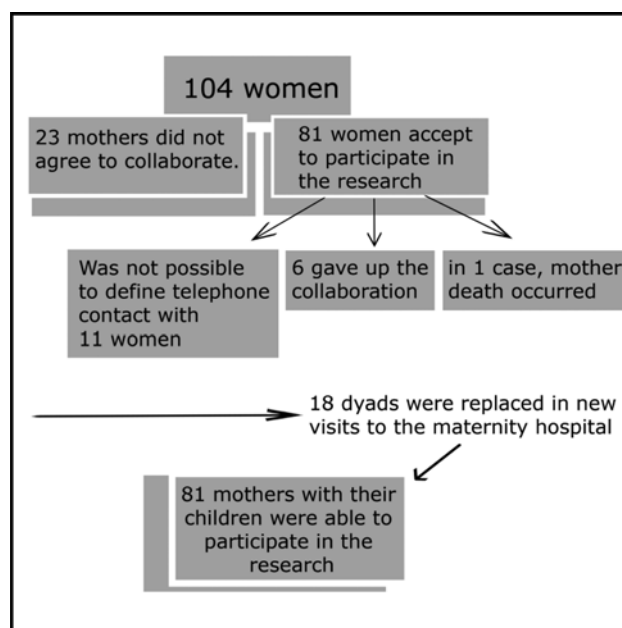


Fig. 1 Flowchart of the patients included in the study.

not agree to collaborate. In addition, even after signing the Consent Form at the maternity hospital, it was not possible to define telephone contact with 11 women to schedule a home visit, 6 gave up the collaboration and, in 1 case, the mother died. At the last moment, therefore, 18 dyads were replaced in new visits to the maternity hospital. However, it was possible to reach a minimum value allowed by the sample calculation and 81 mothers with their children were able to participate in the research (►Fig. 1).

Analyzing the demographic data, there were no differences between the three groups related to age ( $26.1 \pm 3.7$  years old), marital status (64.2% married), schooling level (55.5% higher education complete or incomplete degree), gestational planning (76.5% planned), familiar income ( $3.0 \pm 1.3$  minimum wages), type of maternity (public or private institution) (61.7% public), and child age at filming ( $101.8 \pm 3.4$  days). On the other hand, there were differences between the three groups on the gestational age at delivery, breastfeeding and weight at birth (►Table 1).

Analyzing properly the POIMB 0–6 instrument, 4 questions from 12 items related to the mother behavior showed a statistical difference between the 3 groups (►Table 2). Among the 12 maternal assessment items, 7 did not present statistical significance according to observers 1, 2 and 3, respectively: number of verbal communications from mother to child ( $p = 0.644$ ; 0.866 and 0.644), amount of body contact from the child to mother ( $p = 0.347$ ; 0.832 and 0.352), maternal positive expression for the child ( $p = 0.348$ ; 0.219 and 0.274), mother-to-under-child efficiency ( $p = 0.776$ ; 0.744 and 0.859), mother's reaction ( $p = 0.137$ ; 0.137 and 0.174), mother's positive response intensity and child's social behavior ( $p = 0.916$ ; 0.531 and 0.859), mother's negative affect expression ( $p = 0.535$ ; 0.179 and 0.381) and intrusiveness ( $p = 0.763$ ; 0.967 and 0.649).

**Table 1** Different demographic characters according the type of delivery

Variables		VD	ICS	ECS	Total	p-value
		(n = 26)	(n = 27)	(n = 28)	(n = 81)	
Marital status	Stable union	19.2%	18.5%	10.7%	16.0%	0.443
	Married	53.8%	59.3%	78.6%	64.2%	
	Single	23.1%	22.2%	10.7%	18.5%	
	Widow	3.8%	–	–	1.2%	
Schooling	Incomplete fundamental	–	7.4%	–	2.5%	0.091
	Complete fundamental	11.5%	14.8%	–	8.6%	
	Incomplete medium	7.7%	11.1%	–	6.2%	
	Medium complete	19.2%	25.9%	35.7%	27.2%	
	Incomplete Higher	23.1%	18.5%	14.3%	18.5%	
	Graduated	38.5%	22.2%	50.0%	37.0%	
Maternal Age	Average	26.6	25.3	26.3	26.1	0.441
	Median	27.0	25.0	26.0	26.0	
	Minimum	20	20	20	20	
	Maximum	32	33	33	33	
	Standard deviation	3.4	4.1	3.6	3.7	
Gestational planning	Yes	19.2%	29.6%	21.4%	23.5%	0.639
	No	80.8%	70.4%	78.6%	76.5%	
Family income (minimum wages)	Average	2.6	3.0	3.4	3.0	0.184
	Median	2.0	3.0	3.0	3.0	
	Mínimum	1	1	1	1	
	Maximum	5	5	7	7	
	Standard deviation	1.2	1.1	1.6	1.3	
Gestational age (weeks)	Average	39.4	39.7	38.7	39.3	< 0.001
	Median	40.0	40.0	39.0	39.0	
	Minimum	38	38	38	38	
	Maximum	42	42	40	42	
	Standard deviation	2.2	1.1	0.7	1.5	
Childbirth institution	Private	30.8%	40.7%	42.9%	38.3%	0.626
	Public	69.2%	59.3%	57.1%	61.7%	
Breastfeeding	Absent	–	14.8%	32.1%	16.0%	0.013
	Exclusive	69.2%	55.6%	35.7%	53.1%	
	Not exclusive	30.8%	29.6%	32.1%	30.9%	

Abbreviations: ECS, elective cesarean section; ICS, intrapartum cesarean section; VD, Vaginal delivery.

In all of these 4 questions, the Kappa coefficient was > 0.86, a value considered strong agreement (> 0.81). All three observers agreed that mothers who had vaginal delivery responded better than others to the social behavior of the child (question 7). Two out of three observers agreed that the sensitivity of mothers who delivered vaginally is higher than that of the others. Only one observer concluded that mothers who had vaginal delivery had higher amount of visual contact or attempted visual contact (question 2); and gave more attention to the child (question 11). All of the other questions (verbal communication, body contact, affective expression, solace for crying baby, reaction to crying/agitation, intensity of positive reaction, negative af-

fective reaction, and intrusiveness were not different between the three groups).

Of the 8 baby assessment items, 4 were not statistically significant according to observers 1, 2, and 3, respectively: amount of child smile ( $p = 0.780$ ; 0.980 and 0.740), child mood during observation ( $p = 0.481$ , 0.284 and 0.444), amount of vocalization of the child ( $p = 0.306$ ; 0.197 and 0.184) and amount of crying (0.304; 0.553 and 0.503).

For question 21 (quantity and quality of interaction), only observer 1 did not verify statistical significance ( $p = 0.137$ ). For observers 2 and 3, there was significance of  $p = 0.012$  and 0.08, respectively. ► **Table 3** shows the behavior of the babies of the three groups.

**Table 2** Four items where difference was found between the three groups, observed by three examiners

Question*	Kappa/95%CI	Observer		VD (n = 26)	ICS (n = 27)	ECS (n = 28)	p-value		
2	0.91 0.78–1.04	1	Few	–	–		0.034		
			Moderate	7.7%	29.6%	10.7%			
			Many	88.5%	59.3%	42.9%			
			Always	3.8%	11.1%	32.1%			
		2	Few	–	–	14.3%	0.150		
			Moderate	15.%	29.6%	10.7%			
			Many	80.%	59.3%	39.3%			
			Always	3.8%	11.1%	35.7%			
		3	Few	–	–	14.3%	0.095		
			Moderate	11.%	29.6%	10.7%			
			Many	84.%	63.0%	39.3%			
			Always	3.8%	7.4%	35.7%			
7	0.91 0.81–1.00	1	Few	–	–	14.3%	0.001		
			Moderate	11.5%	18.5%	10.7%			
			Many	34.6%	33.3%	28.6%			
			Always	53.8%	48.1%	50.0%			
		2	Few	–	–	10.7%	0.005		
			Moderate	11.%	22.2%	10.7%			
			Many	38.%	33.3%	28.6%			
			Always	50.%	44.4%	46.4%			
		3	Few	–	–	14.3%	0.002		
			Moderate	11.%	18.5%	10.7%			
			Many	42.%	37.0%	28,6%			
			Always	46.%	44.4%	50.0%			
10	0.86 0.73–0.99	1	Moderate	–	7.4%	10.7%	0.007		
			Many	15.4%	40.7%	14.3%			
			Always	84.6%	51.9%	39.3%			
			Moderate	–	7.4%	46.4%		0.072	
		Many	26.%	40.7%	14.3%				
		Always	73.%	51.9%	39.3%				
		3	Moderate	–	7.4%	46.4%	0.018		
			Many	19.%	40.7%	10.7%			
			Always	80.%	51.9%	42.9%			
			11	0.91 0.82–1.00	1	Moderate		19.2%	37.0%
		Many				34.6%	44.4%	28.6%	
		Always				46.2%	18.5%	32.1%	
2	Moderate	11.%				37.0%	39.3%	0.026	
	Many	42.%			48.1%	28.6%			
	Always	46.%			14.8%	32.1%			
	3	Moderate			19.%	37.0%	39.3%		0.082
Many		30.%			44.4%	32.1%			
Always		50.%			18.5%	28.6%			
						39.3%			

Abbreviations: CI, confidence interval. ECS, elective cesarean section; ICS, intrapartum cesarean section; VD, vaginal delivery.

\*2) Amount of visual contact or attempted eye contact from mother to child; 7) Mother's response to the child's social behavior; 10) Maternal sensitivity to the child; 11) Attention of the mother to the child.

**Table 3** Five items where difference was found between the three groups, observed by three examiners related to the baby behavior and dyad interaction

Question*	Kappa/95%CI	Observer		VD (n = 26)		ICS (n = 27)		ECS (n = 28)		p-value
13	0.85 0.77-0.93	1	None	-	-	1	3.7%	1	3.6%	0.001
			Few	3	11.5%	1	3.7%	8	28.6%	
			Moderate	5	19.2%	8	29.6%	12	42.9%	
			Many	11	42.3%	13	48.1%	7	25.0%	
			Always	7	26.9%	4	14.8%	-	-	
		2	None	-	-	1	3.7%	1	3.6%	0.001
			Few	3	11.5%	2	7.4%	8	28.6%	
			Moderate	5	19.2%	9	33.3%	12	42.9%	
			Many	12	46.2%	12	44.4%	7	25.0%	
			Always	6	23.1%	3	11.1%	-	-	
		3	None	-	-	1	3.7%	1	3.6%	0.008
			Few	3	11.5%	1	3.7%	7	25.0%	
			Moderate	7	26.9%	8	29.6%	13	46.4%	
			Many	11	42.3%	14	51.9%	5	17.9%	
			Always	5	19.2%	3	11.1%	2	7.1%	
14	0.82 0.72-0.91	1	None	-	-	-	-	2	7.1%	< 0.001
			Few	-	-	1	3.7%	7	25.0%	
			Moderate	7	26.9%	16	59.3%	13	46.4%	
			Many	13	50.0%	9	33.3%	5	17.9%	
			Always	6	23.1%	1	3.7%	1	3.6%	
		2	None	-	-	-	-	2	7.1%	< 0.001
			Few	-	-	2	7.4%	7	25.0%	
			Moderate	7	26.9%	15	55.6%	12	42.9%	
			Many	12	46.2%	9	33.3%	6	21.4%	
			Always	7	26.9%	1	3.7%	1	3.6%	
		3	None	-	-	-	-	2	7.1%	<0.001
			Few	-	-	1	3.7%	7	25.0%	
			Moderate	7	26.9%	15	55.6%	11	39.3%	
			Many	13	50.0%	10	37.0%	7	25.0%	
			Always	6	23.1%	1	3.7%	1	3.6%	
15	0.84 0.72-0.96	1	Few	-	-	1	3.7%	1	3.6%	0.065
			Moderate	3	11.5%	7	25.9%	11	39.3%	
			Many	19	73.1%	17	63.0%	13	46.4%	
		2	Always	4	15.4%	2	7.4%	3	10.7%	0.038
			Few	-	-	1	3.7%	2	7.1%	
			Moderate	4	15.4%	11	40.7%	10	35.7%	
		3	Many	18	69.2%	13	48.1%	14	50.0%	0.030
			Always	4	15.4%	2	7.4%	2	7.1%	
			Few	-	-	1	3.7%	2	7.1%	
16	0.79 0.66-0.91	1	Moderate	-	-	1	3.7%	3	10.7%	0.079
			Many	8	30.8%	9	33.3%	13	46.4%	

**Table 3** (Continued)

Question*	Kappa/95%CI	Observer		VD (n = 26)		ICS (n = 27)		ECS (n = 28)		p-value		
21	0.80 0.69–0.91	2	Always	18	69.2%	17	63.0%	12	42.9%	0.008		
			Moderate	–	–	1	3.7%	5	17.9%			
			Many	8	30.8%	11	40.7%	14	50.0%			
		3	Always	18	69.2%	15	55.6%	9	32.1%	0.054		
			Moderate	1	3.8%	–	–	4	14.3%			
			Many	8	30.8%	10	37.0%	13	46.4%			
		1		1	Always	17	65.4%	17	63.0%	11	39.3%	0.137
					Moderate	3	11.5%	8	29.6%	12	42.9%	
					Many	15	57.7%	14	51.9%	9	32.1%	
				2	Always	8	30.8%	5	18.5%	7	25.0%	0.012
					Moderate	3	11.5%	8	29.6%	12	42.9%	
					Many	15	57.7%	14	51.9%	14	50.0%	
				3	Always	8	30.8%	5	18.5%	2	7.1%	0.008
					Moderate	2	7.7%	7	25.9%	12	42.9%	
					Many	17	65.4%	15	55.6%	14	50.0%	
			Always	7	26.9%	5	18.5%	2	7.1%			

Abbreviations: CI, confidence interval. ECS, elective cesarean section; ICS, intrapartum cesarean section; VD, vaginal delivery.

\*13) Number of times the child looks at the mother's face; 14) The child's responses to the mother's communicative stimulus; 15) Intensity with which the child responds positively to the attempt to establish communication; 16) to establish verbal and/or physical contact with the mother; 21) Quantity and quality of the interaction (communication, contact).

All the 3 observers agreed that children who were born vaginally looked more frequently at the mother's face (question 13,  $p \leq 0.008$ ) and responded more frequently to the mother's communicative stimulus (question 14,  $p < 0.001$ ).

Two observers agreed that the children who delivered vaginally responded more positively and intensively to their mothers' communication attempts (question 15). In these 3 questions, Kappa coefficients showed strong concordance (Kappa  $> 0.81$ ). A higher amount of eye/body contact to the mother from the baby born vaginally (question 16) than in the elective cesarean group was observed by only one examiner. This test was considered to have good concordance according to the Kappa coefficient (0.79, between 0.61 and 0.80). Finally, considering the dyad interaction (question 21), its Kappa coefficient showed good concordance (0.80). In this question, the children born vaginally also had better interaction.

All of the other questions (amount of smile, child humor, child vocalization and amount of crying) were similar between the three groups. It can be said that the present study allowed the observation of the existence of a better interaction between the dyads representing normal delivery.

## Discussion

According to the English psychoanalyst Bowlby,<sup>11</sup> it is important that the development of attachment and the relationship between mother and baby occur in the first months of the child's life. According to the author, attachment can be measured, as it is the result of behaviors and interactions.

Childbirth represents a holistic phenomenon, as it involves biological, psychological, social, economic and cul-

tural factors, which influence in choosing the mode of delivery. Women who opt for vaginal delivery justify their choice due to rapid recovery after childbirth.<sup>12,13</sup> On the other hand, fear of childbirth is one of the main justifications for a preference for cesarean section.<sup>12</sup>

In Brazil, there is a "cesarean culture", where childbirth means different medical care, childbirth without pain, preserved sexuality, among others.<sup>14</sup> Both types of delivery can generate both benefits and harms for the mother and baby, especially with regard to psychological aspects. The memories of the experience of childbirth, especially of the first child, influence maternal perceptions for a long period, they remain intact on the cognitive and psychological level. In this context, despite cesarean section being a safe procedure, it should be performed only when its benefits are shown to outweigh the risks.<sup>14,15</sup>

One study verified the existence of greater neonatal morbidity in newborns delivered vaginally when compared with neonates born by cesarean section. On the other hand, it pointed to higher maternal morbidity in puerperal women submitted to cesarean sections.<sup>16</sup> Mothers of babies born by vaginal delivery, according to a study, show a higher frequency of loving behavior directed to their babies, registering the presence of a better interaction in the occurrence of vaginal births.<sup>17</sup>

► **Table 4** shows an analysis of studies that compared the mother-child interaction with the mode of delivery. It is worth mentioning that none of the studies mentioned used the POIMB 0–6 as an instrument for analyzing the interaction.

The analysis of the results of the present study showed that the mother's response to the child's social behavior, the child's response to the mother's communicative stimulus

**Table 4** Results of studies related to the quality of mother-child interaction according to the mode of delivery

Authors / Year of publication	Title	Main findings
Bradley et al (1983) <sup>18</sup>	A prospective study of mother's attitudes and feelings following cesarean sections and vaginal deliveries.	According to the results of the study, women who had vaginal delivery had the best attitudes toward the baby.
Cranley et al (1983) <sup>19</sup>	Women's perceptions of vaginal delivery and cesarean section	Among the three groups studied – vaginal delivery, emergency cesarean section and elective cesarean section – the emergency cesarean group had more negative perception regarding the experience of delivery. In addition, women in cesarean groups are less likely to breastfeed, a fact that disqualifies mother-child interaction.
Hwang (1987) <sup>20</sup>	Cesarean childbirth in Sweden: Effects on the mother and father infant relationship.	The results of the study show that mothers of babies born by caesarean section reacted less positively when they first saw their children and had more difficulty breastfeeding than mothers of vaginal deliveries.
Gathwala et al (1991) <sup>17</sup>	Influence of cesarean section on mother-baby interaction	Mothers in the representative group of vaginal delivery show an affective more significant behavior compared with mother's representative of the cesarean section.
Rocha et al (2003) <sup>21</sup>	[Mother-child attachment: a comparative study between mothers with vaginal delivery and cesarean section]	Mothers of cesarean section need more attention to initiate breastfeeding. Both perform well in the care of the newborn in the postpartum period.
Olza Fernández et al (2013) <sup>22</sup>	Mode of delivery may influence neonatal responsiveness to maternal separation	No differences were observed related to the mode of delivery; however, it was observed that children born by caesarean section cry less when they are separated from their mothers.
Carlander et al (2010) <sup>23</sup>	Contact between mother, child and partner and attitudes toward breastfeeding in relation to mode of delivery	The mode of delivery does not seem to affect the way mothers experience their contact with the newborn. However, mothers who had a vaginal delivery started breastfeeding in a less stressful manner than mothers who had cesarean delivery.
Zanardo et al (2010) <sup>24</sup>	Elective cesarean delivery: does it have a negative effect on breastfeeding?	Emergency and elective cesarean sections achieve lower success rates in exclusive breastfeeding compared with vaginal delivery.
Lai et al (2015) <sup>25</sup>	Postpartum fatigue, babycare activities, and maternal-infant attachment of vaginal and cesarean births following rooming-in.	Women undergoing cesarean section had greater postpartum fatigue and, consequently, greater difficulty in baby care activities than women who had vaginal delivery.
Pilch (2015) <sup>26</sup>	The influence of birth modus on the emotional state of the mother, bonding, and the newborn's neurobehavioral state	Babies born vaginally had higher levels of cortisol and more frequent direct contact with mothers after delivery, which creates favorable conditions for the formation of bonds.

and maternal sensitivity were the highest in the vaginal delivery group. In addition, higher rates of exclusive breastfeeding were found in this group. The process of interaction between mother and child triggered by vaginal delivery may follow a sequence of behavior modulating events, allowing to positively interfere with the interaction in relation to representative groups of elective cesarean section and intrapartum cesarean section.

When establishing in the methodology of research that the analysis of the evaluation between the dyad would be realized from the making of video footage, the following question arose: could the mother act unnaturally because she knew that she was being filmed? In this context, in addition to the previous requests given to the mother

regarding the importance of acting naturally, it also supported the question of intrusiveness – exaggerated behavior of the mother toward the child – that is, an abnormal or forced reaction related to being filmed could be detected in the analysis and would decrease the score related to item 12 corresponding to the intrusiveness analysis. Maybe related to the mothers, they can behave unnaturally, but not the children. Then, we can trust that the choice of the POIMB 0–6 in the present study was satisfactory, since it allowed the detailed analysis of interaction patterns from action sequences and events between the subjects. When there was difference between groups, the concordance between two or three observers was larger related to the children (four questions) than mother behavior (two questions).<sup>2</sup> Children



born vaginally seem to interact better with their mothers than those born by caesarean section.

In animal models, the oxytocin release during parturition is essential for awaking maternal behavior.<sup>27</sup> Maybe the human being is not so distant from these mammals, related to the importance of this “oxytocin inundation” to the onset of maternal-infant bond, including breastfeeding event.

A justification for a better interaction can be understood according to an endogenous oxytocin action, which can trigger a sequence of actions and produce effects that allow continuous activation of the hormone after delivery. In other words, sharing is accompanied by the intense activation and onset of a neuroendocrine cascade that triggers lactation and stimulates interaction.

The possibility of measuring the serum levels of endogenous oxytocin is considered, and its concentration being able to relate to the quality of the maternal-filial interaction. Such possibility of research causes instigation and, therefore, may reinforce the results presented by the present study. From this psychosomatic point of view, it is interesting the research in neuroscience to determinate in which proportion oxytocin is an important factor for affective behavior. It would be a reflection made by obstetricians related to the high incidence of elective cesarean section without medical indication.

Despite the results found and the established conclusion, it is wrong, or perhaps daring, to affirm or suggest that the interaction between the dyads representing the occurrence of cesarean section is negative, since, in addition to the close scores, there are several other factors that may, perhaps, interfere in the results, even if in a camouflaged way. However, it is a fact that the occurrence of vaginal delivery corresponds to an important trigger for the initiation of the oxytocin release process, acting as a facilitator in the process.

Given that this possible higher difficulty exists in the interaction of cesarean sections, it is important that health professionals pay attention to these cases with regard, for example, to stimulation of breastfeeding and skin-to-skin contact with the newborn, even if late.

## Conclusion

In summary, when assessing the quality of maternal-filial interaction through the POIMB 0-6 in relation to the type of delivery, considering the occurrence of vaginal delivery, intrapartum cesarean section and elective cesarean section, it is concluded that the interaction between the mother-child dyad is quantitatively larger and qualitatively better in vaginal delivery when compared with intrapartum or elective cesarean section.

### Contributors

Santos Neto C. H., Oliveira F. S., Gomes G. F., Araujo Júnior E., Nakamura M. U. and Souza E. declared to have contributed with the conception of the study, collection and tabulation, intellectual critical review, drafting of the manuscript and final approval of the version to be published.

### Conflict of Interests

The authors have no conflict of interests to declare.

## References

- 1 Bowlby J. Attachment and Loss. New York: Basic Books; 1969. vol. 1
- 2 Piccinini CA, Seidl de Moura ML, Ribas AFP, et al. Diferentes perspectivas na análise da interação pais-bebê/criança. *Psicol Reflex Crit.* 2001;14(03):469-485. Doi: 10.1590/S0102-79722001000300004
- 3 Lopes FA, Arruda MF. Do conflito de interesses à cooperação: a interação mãe-bebê numa perspectiva etológica. In: Piccinini CA, Moura MLS, organizadores. eds. Observando a interação pais-bebê-criança. São Paulo: Casa do Psicólogo; 2007:19-36
- 4 Alfaya C, Schermann L. Sensibilidade e aleitamento materno em díades com recém-nascidos de risco. *Estud Psicol (Natal)*. 2005;10(02):279-285. Doi: 10.1590/S1413-294X2005000200015
- 5 Pinto EB. A análise das interações pais/bebê em abordagem psicodinâmica: clínica e pesquisa. In: Piccinini CA, Moura MLS, organizadores. Observando a interação pais-bebê-criança. São Paulo: Casa do Psicólogo; 2007:37-72
- 6 Zerbinatti AC. Descrição da interação de mães e seus bebês nascidos prematuros. In: Anais da 19a Semana de Psicologia e 6o Congresso de Psicologia; 2012. Bauru: UNESP; 2012:38-44
- 7 Ribas AFP, Moura MLS, Ribas RC Junior. Responsividade materna: levantamento bibliográfico e discussão conceitual. *Psicol Reflex Crit.* 2003;16(01):137-145. Doi: 10.1590/S0102-79722003000100014
- 8 Schermann L. Observação do comportamento social. *PSICO.* 1999; 30(02):95-102
- 9 Schermann L. Avaliação quantitativa e qualitativa da interação mãe-bebê. In: Piccinini CA, Moura MLS, organizadores. Observando a interação pais-bebê-criança. São Paulo: Casa do Psicólogo; 2007:155-176
- 10 Bornstein MH, Lamb ME. Development in Infancy: An Introduction. New York: McGraw-Hill; 1992
- 11 Bowlby J. Cuidados maternos e saúde mental. São Paulo: Martins Fontes; 1988
- 12 Figueiredo NSV, Barbosa MCA, Silva TAS, Passarini TM, Lana BN, Barreto J. Fatores culturais determinantes da escolha da via de parto por gestantes. *HU Rev.* 2010;36(04):296-306
- 13 Faúndes A, Pádua KS, Osis MJD, Cecatti JG, Sousa MH. [Brazilian women and physicians' viewpoints on their preferred route of delivery]. *Rev Saude Publica.* 2004;38(04):488-494. Doi: 10.1590/S0034-89102004000400002
- 14 Lopes RCS, Donelli TS, Lima CM, Piccinini CA. O antes e o depois: expectativas e experiências de mães sobre o parto. *Psicol Reflex Crit.* 2005;18(02):247-254. Doi: 10.1590/S0102-79722005000200013
- 15 Zimmermann JB, Gomes CM, Tavares FSP, Peixoto IG, Vieira de Melo PC, Rezende DF. [Puerperal diseases associated to delivery]. *Rev Med Minas Gerais.* 2009;19(02):109-116
- 16 Cardoso PO, Alberti LR, Petriano A. [Neonatal and maternal morbidity related to the type of delivery]. *Cien Saude Colet.* 2010;15(02):427-435. Doi: 10.1590/S1413-81232010000200019
- 17 Gathwala G, Narayanan I. Influence of cesarean section on mother-baby interaction. *Indian Pediatr.* 1991;28(01):45-50
- 18 Bradley CFB, Ross SE, Warnyca J. A prospective study of mothers' attitudes and feelings following cesarean and vaginal births. *Birth.* 1983;10(02):79-83. Doi: 10.1111/j.1523-536x.1983.tb01405.x
- 19 Cranley MS, Hedahl KJ, Pegg SH. Women's perceptions of vaginal and cesarean deliveries. *Nurs Res.* 1983;32(01):10-15
- 20 Hwang CP. Cesarean childbirth in Sweden: effects on the mother and father infant relationship. *Infant Ment Health J.* 1987;8(02): 91-99. Doi: 10.1002/1097-0355(198722)8:2<91:AID-IMHJ2280080202>3.0.CO;2-D
- 21 Rocha SM, Simpionato E, de Mello DF. [Mother-child bonding: comparative study of mothers after normal delivery and cesarean section]. *Rev Bras Enferm.* 2003;56(02):125-129. Doi: 10.1590/S0034-71672003000200002

- 22 Olza Fernández I, Marín Gabriel MA, García Murillo L, Malalana Martínez AM, Costarelli V, Millán Santos I. Mode of delivery may influence neonatal responsiveness to maternal separation. *Early Hum Dev.* 2013;89(05):339–342. Doi: 10.1016/j.earlhumdev.2012.11.005
- 23 Carlander AK, Edman G, Christensson K, Andolf E, Wiklund I. Contact between mother, child and partner and attitudes towards breastfeeding in relation to mode of delivery. *Sex Reprod Healthc.* 2010;1(01):27–34. Doi: 10.1016/j.srhc.2009.10.001
- 24 Zanardo V, Svegliado G, Cavallin F, Giustardi A, Cosmi E, Litta P, Trevisanuto D. Elective cesarean delivery: does it have a negative effect on breastfeeding? *Birth.* 2010;37(04):275–279. Doi: 10.1111/j.1523-536X.2010.00421.x
- 25 Lai YL, Hung CH, Stocker J, Chan TF, Liu Y. Postpartum fatigue, baby-care activities, and maternal-infant attachment of vaginal and cesarean births following rooming-in. *Appl Nurs Res.* 2015;28(02):116–120. Doi: 10.1016/j.apnr.2014.08.002
- 26 Pilch D. [The influence of birth modus on the emotional state of the mother, bonding, and the newborn's neurobehavioural state]. *Pomeranian J Life Sci.* 2015;61(03):249–256
- 27 Spengler FB, Scheele D, Marsh N, Kofferath C, Flach A, Schwarz S, et al. Oxytocin facilitates reciprocity in social communication. *Soc Cogn Affect Neurosci.* 2017;12(08):1325–1333. Doi: 10.1093/scan/nsx061