Lighting impact on the emotional expression of pregnant women: a randomized clinical trial

Influência da iluminação nas expressões emocionais de parturientes: ensaio clínico randomizado

Michelle Gonçalves da Silva[1]
Antonieta Keiko Kakuda Shimo[2]

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Expressed emotion; Lighting; Delivery rooms; Natural childbirth; Obstetric nursing

Descritores
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Abstract

Objective: To identify and compare the emotional expression of pregnant women during the stage of expulsion under common and regular lighting and low lighting.

Methods: Pragmatic, randomized controlled clinical trial. Ninety-five pregnant women were selected, and divided into two groups: common and regular lighting and low lighting in the delivery room.

Results: The most evident emotion during the stage of expulsion is anger (33.9%). The differences between the study groups regarding the presence of emotions are significant: fear ($p< 0.0001$), disgust ($p = 0.0091$), and sadness ($p = 0.0060$) were more evident for the group under common and regular lighting. The group under low lighting expressed more joy ($p< 0.0001$) and anger ($p< 0.0001$). All pregnant women finished their deliveries feeling joy.

Conclusion: Low lighting provides a series of emotions that respect and help women's physiology during the stage of expulsion in labor.

Resumo

Objetivo: Identificar e comparar as expressões emocionais das parturientes no período expulsivo sob iluminação comum e usual e com baixa luminosidade.

Métodos: Ensaio clínico, controlado e randomizado de abordagem pragmática. Selecionado 95 parturientes, divididas em dois grupos: iluminação comum e usual e baixa luminosidade da sala de parto.

Resultados: A emoção mais presente no período expulsivo é a raiva (33,9%). As diferenças entre os grupos do estudo quanto à presença de emoções são significativas: medo ($p< 0,0001$), nojo ($p = 0,0091$) e tristeza ($p = 0,0060$) estiveram mais presentes no grupo de iluminação comum e usual. Já o grupo de baixa luminosidade apresentou mais alegria ($p< 0,0001$) e raiva ($p< 0,0001$). Todas as parturientes terminaram seus partos com a emoção alegria.

Conclusão: O ambiente com baixa luminosidade promove uma sequência de emoções que respeita e auxilia a fisiologia do período expulsivo do trabalho de parto.

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Corresponding author
Michelle Gonçalves da Silva
Rua Tessália Vieira de Camargo, 126,
13083-887, Campinas, SP, Brasil.
michelle.goncalves1982@gmail.com

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[1]Universidade Estadual de Campinas, Campinas, SP, Brazil.
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Introduction

Childbirth represents a milestone in the life of women, since it has a profound effect on physical, mental, emotional, and social aspects. No other event in the life of a human being involving pain, emotional overload, vulnerability, possible physical damages, and even death is so complex, besides amounting to a definitive role shift, including the responsibility of taking care and promoting the development of other totally dependent human being.[1]

Environmental factors and the emotional state of pregnant women can have an impact on labor, especially during the stage of expulsion in the delivery room. Among these factors are respect regarding individuality/privacy, presence of a companion, supportive environment, presence of noise, multi-professional team care, and low lighting.[1]

The presence of steady lighting in hospitals stimulates the cerebral cortex of women in labor. According to the environmental theory of Florence Nightingale, it is not the intensity of light that is important for the binomial care, but its quality. She believed that sunlight probably did not interfere with the cortex of mothers, and that women felt comfortable with this kind of contact. Conversely, she claimed that artificial lights inhibit the primal cortex, whereas low light stimulates it. Thus, keeping the environment as natural as possible is a care technology, taking into account that, during the stage of expulsion, women must deactivate their neocortex and activate the primitive brain in order to guarantee the hormonal balance necessary for an adequate parturition physiology.[2]

Scientific studies have been discussing the need to have a deeper understanding on the natural contexts, based on individual emotional expressions, and challenging the old paradigm that emotion and reason are two distinct mechanisms. It can be noted that these two processes are interconnected along with the prefrontal cortex functions and the limbic system. Consequently, emotion has the power to influence rationality, personal relationships, motor skills, and decision-making processes, which are expressed in traits, gestures and facial motricity, physiognomic and mimic aspects, speech intonation, quality or intonation of gestures, and posture variations.[3]

This concern regarding how the ambiance is structured at the moment of labor is perceived by the authors by indicating that low lighting stimulates emotional expressions of pregnant women during the expulsive stage. Thus, women feel less observed and have their privacy preserved, with more focus and respect from the multi-professional team assisting them, which in turn facilitates the parturition process.

It was believing in this supportive parturition setting that is opposed to the childbirth institutionalization model, practiced in a technocratic manner, commonly applied after the second half of the 20th century by most of Brazilian maternities, and also given the lack of studies on the benefits of an environment with low lighting in the delivery room, that the researchers developed this study based on the following question: Does a delivery room setting with low lighting stimulate different emotional expressions in pregnant women compared to a common and regular lighted environment?

The objectives of the study were to identify and compare emotional expressions of pregnant women during the stage of expulsion under common and regular lighting and with low lighting.

Methods

Type of study

This is a pragmatic, controlled, randomized, and clinical experimental trial (protocol # ReBEC: U1111-1148-4976) with the aim of conducting a clinical practice study to test the influence of lighting in the delivery room on emotional manifestations of pregnant women, applying the Facial Action Coding System (FACS).[4,5] It was carried out from February to April 2015 in the Obstetric Center of Municipal Hospital Prof. Dr. Alípio Correa Netto, located in the eastern zone of São Paulo city, state of São Paulo.

This study was preceded by the approval of the Research Ethics Committee of the State University

of Campinas, with co-partnership of the Research Ethics Committee of the Municipal Health Office of São Paulo (Approval no. 654.694) in accordance with resolution no. 466/2012 of the National Health Council, authorized by the participating healthcare institution and as per an informed consent form signed by the pregnant women.

Population and sample

The study population consisted of women undergoing vaginal delivery and assisted, during the stage of expulsion, by 10 nurse-midwives of the Obstetrician Center at the participating institution, who previously received the study basic guidelines and were on duty at the moment of data collection.

This population was divided into two groups: Control Group (CG), consisting of pregnant women that had vaginal delivery in a common and regular setting (all lights on in the delivery room); and Intervention Group (IG), consisting of pregnant women that had vaginal delivery in a setting with low light (only surgical lights on and positioned in the lower part of the table with light beam focused on where the perineal region of pregnant women is routinely accommodated).

The study included pregnant women that met the following criteria: being over 18 years of age; having a full-term pregnancy and fetus in cephalic presentation; with no clinical and/or obstetric complications; cervical dilatation equal or lower than six centimeters at the time of hospital admission, presence of a companion of her choice during labor, and understanding Portuguese language.

The study excluded women previously diagnosed with mental illnesses, and women that experienced clinical or obstetric complications during the stage of expulsion. The sample was composed after a pilot trial, initially consisting of 30 pregnant women, and divided as follows: 15 in the CG and 15 in the IG. Three pregnant women were excluded from the study due to clinical complications during labor, totaling 27 pregnant women in the pilot trial.

In addition, a power of 80% and a significance level of 5% in the sample estimates were assumed. Taking into account the objective of comparing the control and the intervention groups in relation to the occurrence rate of "fear", "joy", and "anger" emotions, the remaining emotions were not included in the sample calculation because of lack of statistically significant differences. The sample size obtained by the unpaired t-student test was 14 individuals per group (Table 1).

Randomization was carried out through random selection with sequentially numbered opaque envelopes containing the information on which group the pregnant women were participating. These envelopes were developed and sealed by the Statistical Office of the Unicamp Nursing School, and their content was unknown by the researcher and the patients. The information on which group they belonged was only revealed after the pregnant women had signed the informed consent form to participate in the study, and with the researcher opening the envelope during labor.

Intervention

In the first contact with the pregnant women (time of admission or during stay in the prenatal, respecting the cervical dilatation equal or lower than 6 cm criterion), the purpose of the study was explained, including the shooting of their face during childbirth, as well as the request to sign the consent form and the opening of the randomization envelope, considering the delivery room lighting as the intervention proposed and applied, and the facial expressions coded according to the results found from this intervention.

Table 1. Mean, standard deviation, alpha, and power values and number of pregnant women suggested for composing the sample according to fear, joy, and anger

Variable	Contr Mean	Contr Standard Deviation	Exp Mean	Exp Standard Deviation	Alpha	Power	n/group
Fear	30.17	11.53	2.80	2.70	0.05	0.80	4
Joy	21.58	5.14	29.20	8.19	0.05	0.80	14
Anger	24.58	11.77	50.73	12.76	0.05	0.80	5

Facial image capture: regardless of the lighting chosen for the delivery room after randomization (CG or IG), an Aiptek Go HD Blue with 720p™ camcorder was used, duly approved by Inmetro, and specific for capturing precise images in a poorly lit setting. The camcorder was held by the researcher, who was positioned next to the gynecological table for adequate shooting and visualization of the facial image of the pregnant women during the stage of expulsion in both study situations, assuming the possibility of causing some embarrassment to the pregnant women. However, during data collection, this possibility of embarrassment was not an issue as expressed verbally by all the pregnant women immediately after giving birth, who denied having had such a feeling, since they were aware of the study and, during childbirth, they did not even notice the shooting because of the particular intense moment they were experiencing.

The camcorder was turned on at the moment the nurse-midwife entered the delivery room, and it was turned off after placenta abruption, varying the intervention exposure time since each woman had a different time of expulsion.

The nurse-midwives on duty at the time of data collection received basic instructions on the purpose of the study and previous training regarding the institutional protocol for conducting the pregnant women to the delivery room during the stage of expulsion only (full dilatation, fetal presentation higher than +1 of De Lee plan, and presence of involuntary bearing-down efforts).

Variables

- Independent: delivery room lighting;
- Dependent: facial expressions of pregnant women, classified according to the FACS, such as: fear, joy, anger, sadness, surprise, and disgust;
- Characterization: age, school level, parity, preparation for childbirth, marital status, ethnicity, use of oxytocin during labor and childbirth, duration of expulsion, acceptance of pregnancy, skin-to-skin contact, and Apgar score.

Data analysis

For ensuring proper reading of the facial expression coding and the recognition of real emotions, one of the researchers decided to study the FACS, obtaining the entire system from its creators. This in-depth study on facial coding required intense dedication that took more than one year of study. After all the knowledge acquired, the researcher took an International Paul Ekman Group test on the skills of facial movement coding and emotions in December, 2014. After passing the test, she became the first Brazilian official FACS facial encoder, making viable this research and, thus, guaranteeing data analysis accuracy.

The FACS breaks down facial actions into small units called "action units", in which each unit represents an individual muscle action or an action of a small group of muscles in a recognizable facial expression (Figure 1). In total, the classification of 66 action units, combined after comparisons and corrections of specific scores by FACS Score Checker software, can generate six well-defined expressions of facial emotions: fear, joy, disgust, sadness, and surprise, regardless of cultural differences (Charts 1 and 2).[4,6]

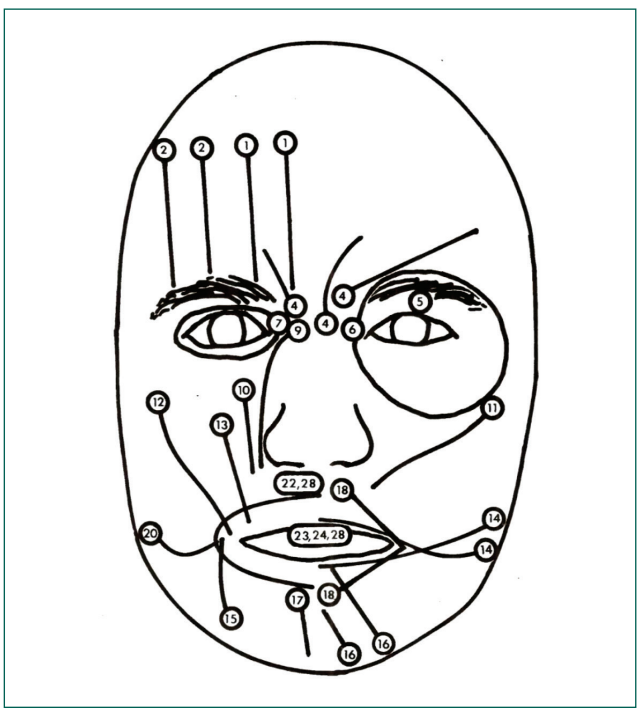

Figure 1. Schematic representation of the FACS measurement units

Chart 1. Action units (AUs) according to facial muscle actions, based on the FACS

AU	Facial muscle action
Upper face	
1	Inner brow raising
2	Outer brow raising
4	Brow lowering
5	Upper eyelid raising
6	Cheek raising
7	Eyelid tightening
43	Eyes closed
45	Blinking both eyes
46	Winking one eye
Lower face	
9	Nose wrinkling
10	Upper lip raising
11	Nasolabial deepening
12	Lip corner pulling
13	Intense lip corner pulling
14	Dimple
15	Lip corner depressing
16	Lower lip depressing
17	Chin raising
18	Lip puckering
20	Lip stretching
22	Lip funneling
23	Lip tightening
24	Lip pressing
28	Lip sucking
Head movements	
51	Head turn left
52	Head turn right
53	Head up
54	Head down
55	Head tilt left
56	Head tilt right
57	Head forward
58	Head back
Eye movements	
61	Eyes turn left
62	Eyes turn right
63	Eyes up
64	Eyes down
65	Each eye looking to an outer side
66	Eyes looking in
Lip parting and jaw opening	
25	Lip parting
26	Jaw dropping
27	Mouth stretching
Other AUs	
8	Lips toward each other
19	Tongue showing
21	Neck tightening
29	Jaw thrusting
30	Jaw sideways
31	Jaw clenching
32	[Lip] biting
33	[Cheek] blowing
34	[Cheek] puffing
35	[Cheek] sucking
36	[Tongue] bulging
37	Lip wiping
38	Nostril dilation
39	Nostril compression

Source: Ekman et al., 2002 and Ekman&Friesen, 1978

Chart 2. Emotions according to key combinations of Action Units (AUs) and their main variations, based on the FACS

Emotion	AU combination	Main variations
Surprise	1+2+5B+26	1+2+5B
	1+2+5B+27	1+2+26
		1+2+27
		5B+26
		5B+27
Fear	1+2+4+5*+20+25,26 or 27	1+2+4+5*+L or R20*+25,26 or 27
	1+2+4+5*+25,26 or 27	1+2+4+5*
		1+2+5Z, with or without 25,26,27
		5*+20* with or without 25,26,27
Joy	6+12*	
	12C/D	
Sadness	1+4+11+15B with or without 54+64	1+4+11 with or without 54+64
	1+4+15* with or without 54+64	1+4+15B with or without 54+64
	6+15* with or without 54+64	1+4+15B+17 with or without 54+64
		11+17
		25 or 26 can occur with all AU combinations or with main variations.
Disgust	9	
	9+16+15,26	
	9+17	
	10*	
	10*+16+25,26	
	10+17	
Anger	4+5*+7+10*+22+23+25,26	Any combination of AUs without any of the following AUs: 4,5,7 or 10
	4+5*+7+10*+23+25,26	
	4+5*+7+23+25,26	
	4+5*+7+17+23	
	4+5*+7+17+24	
	4+5*+7+23	
	4+5*+7+24	

Source: Ekman et al., 2002 and Ekman&Friesen, 1978

Data were analyzed and coded in a two-step procedure:

Step A: evaluation and coding of images captured from emotion manifestations of pregnant women (mean of four codes per image second), based on the Facial Action Coding System.

Step B: coding comparison and correction carried out by the researcher using a comparative analysis of the facial images watching the videos and assuring the proper interpretation of the emotions through the FACS Score Checker software,[4] which allowed the researcher to refer to the final coding of the image under evaluation and compare this coding with an image provided by the software database.

Results

The Control Group was comprised of 46 pregnant women, and the Intervention Group of 54 pregnant

women, totaling n = 95, higher than the requested for the sample calculation (14 pregnant women per group), however of great value in terms of statistical calculations and accuracy of the results. Table 2 shows the overall characteristics of the participants and the main quantitative evaluations of the study, according to the variables age, school level, parity, cervical dilation at admission, first- and fifth-minute Apgar, and prevalence of six emotions.

Table 2. Distribution of study variables and presence of emotions in the total amount of deliveries, according to quantitative analysis

Variables	n	Mean	Standard deviation
Age	95	26.52	7.48
School level	95	8.82	2.51
Previous pregnancies	95	2.95	2.22
Previous vaginal deliveries	95	1.42	1.88
Previous abortions	95	0.34	0.74
Cervical dilation at admission	95	4.82	1.02
Time of expulsion	95	16.92	10.58
1st min Apgar	95	8.55	0.71
5th min Apgar	95	9.65	0.50
Fear	95	20.40	17.13
Joy	95	24.81	7.81
Anger	95	33.99	18.29
Disgust	95	2.97	3.74
Sadness	95	1.91	2.99
Surprise	95	15.62	7.14

n=95

Analyzing the results of all pregnant women, none received orientation for childbirth and all verbally expressed accepting the pregnancy. Most of the participants (43 = 45.2%) had brown skin and 65 (68.4%) had a partner. Regarding childbirth with use of synthetic oxytocin, most did not use this medication (59 = 62.1%) and 81 (85.2%) of the births benefited from skin-to-skin contact. The differences between the study groups related to presence of emotions are shown in table 3.

During the coding process, it was noted that, in both groups, emotions followed a line of appearance and concentration. For better assessing this distribution, the coding and results were divided into six alternating sequences of emotions. However, some of the pregnant women showed five periods of emotion. Evaluating the sequential order of appearance and predominance of emotions during the evolution of the stage of expulsion and comparing CG with IG, it was possible to analyze the p-value through the chi-squared test and Fisher's exact test, as presented in table 4.

Table 3. Frequency of emotions between control and intervention groups

Emotion	Group	n	Mean	Standard deviation	p-value*
Fear	Control	46	34.33	10.63	< 0.0001
	Intervention	49	7.33	10.43	
Joy	Control	46	21.70	5.36	< 0.0001
	Intervention	49	27.73	8.63	
Anger	Control	46	21.50	10.38	< 0.0001
	Intervention	49	45.71	16.26	
Disgust	Control	46	4.13	4.36	0.0091
	Intervention	49	1.88	2.66	
Sadness	Control	46	2.57	2.81	0.0060
	Intervention	49	1.29	3.04	
Surprise	Control	46	15.13	7.18	0.4814
	Intervention	49	16.08	7.16	

*p-value obtained through Mann-Whitney test

Table 4. Comparison of the sequence of emotions related to the progression of the stage of expulsion, according to the control and intervention groups

Time/Emotion	Group		p-value
	Control n(%)	Intervention n(%)	
Emotion 1			0.1010**
Fear	35(76.09)	30(61.22)	
Disgust	5(10.87)	7(14.29)	
Surprise	1(2.17)	8(16.33)	
Sadness	5(10.87)	4(8.16)	
Emotion 2			0.0277*
Fear	8(17.39)	9(18.37)	
Disgust	11(23.91)	6(12.24)	
Anger	3(6.52)	9(18.37)	
Surprise	12(26.09)	21(42.86)	
Sadness	12(26.09)	4(8.16)	
Emotion 3			0.0022**
Joy	1(2.17)	8(16.33)	
Fear	2(4.35)	0(0.00)	
Disgust	14(30.43)	5(10.20)	
Anger	13(28.26)	20(40.82)	
Surprise	10(21.74)	15(30.61)	
Sadness	6(13.04)	1(2.04)	
Emotion 4			0.0016**
Joy	14(31.11)	20(48.78)	
Disgust	1(2.22)	0(0.00)	
Anger	12(26.67)	17(41.46)	
Surprise	18(40.00)	3(7.32)	
Sadness	0(0.00)	1(2.44)	
Emotion 5			0.0009**
Joy	8(25.81)	16(76.19)	
Anger	18(58.06)	3(14.29)	
Surprise	5(16.13)	2(9.52)	
Emotion 6			
Joy	23(100.00)	5(100.00)	

*p-value obtained through the chi-squared test; **p-value obtained through Fisher's exact test

Analyzing the emotional manifestations of the studied groups in relation to the marital status of the pregnant women, statistically significant differences were noticed, whereas 65 pregnant women reported having partners. When addressing the conduction of the delivery, it always comes to mind the common and regular issue raised by professionals in the field of obstetrics: that the infusion of synthetic oxytocin speeds up labor. However, the data assessed through the Mann-Whitney test showed a contradiction of this routine practice carried out at maternities, and that its use during the stage of expulsion prolongs birth in almost six minutes, with a statistical relevance of $p = 0.0210$.

Discussion

This research sought to study the impact of lighting in the delivery room on the emotional expressions of pregnant women. Since similar studies were not found, data discussion was carried out considering major international studies as reference for emotion coding and how the six analyzed emotions are organized in our body. Furthermore, studies conducted by physiologists dealing with the impact of lighting on human beings were also sought.

The difficulty found was that all studies related to the assessment of women's emotions during the pregnant-puerperal cycle are qualitative in nature, guided by verbalizations of women, thus hampering the comparison with this study.

Analyzing the results on the school level of the pregnant women, there was an attempt to establish the differences in the type of emotion showed along with educational training throughout their lives, considering previously the assumption that the higher the school level, the tougher would be the labor, due to the activation of maternal neocortex of intellectual activity when compared to a higher level of education. However, the findings of the study did not show statistically significant differences between these relationships, because the low schooling level of the pregnant women in the study (mean of 8.8 years) made this comparison difficult.[1]

The mean time of 16.9 minutes in the stage of expulsion was not considered relevant, since labors were carried out by different professionals, each one having a particular way of referring the prenatal pregnant women to the delivery room, despite pre-established training and institutional protocols. There are professionals that only refer pregnant women with total dilation, fetal presentation higher than +1 of DeLee plan, and involuntary bearing-down efforts, whereas others refer them at the earliest possible stage.

Among the six analyzed emotions, "fear" is the most scientifically well-established emotion due to several studies conducted on this topic, probably because it is easy to arouse it with threats of physical or psychological damages, and because it is possible to learn to feel fear of almost anything. Thus, there are qualitative studies in which women strongly verbalize their fear of transition that this moment offers, of the new social role they will assume as mothers, that things might go wrong, fear of death, fear of their child not being totally healthy, fear of not being capable to give birth, fear of not being well-treated and respected and, finally, fear of the greatest worry cast by our Brazilian "Cesareanistic" culture: fear of pain.[7-11]

Fear was present on an average of 20.4% of pregnant women, whereas 100% of women expressed not having received previous orientation or preparation for the labor and childbirth, which unfortunately could be characterized as an inadequate prenatal care[12], thus favoring the exacerbation of this emotion during childbirth.

In contrast to "fear", "joy" is the least studied emotion, probably because almost all studies are dedicated to disturbing emotions that concentrate their worries on the problems, and also probably because the healthcare field puts more value towards the curative aspects, that is, solving problems and forgetting to put an emphasis on what is pleasant.[11]

Among qualitative studies, women that became mothers expressed intense joy for conceiving a child and saw, despite the pain, how childbirth brings a pleasant reward, which is the fulfillment of a dream come true of "becoming a mother", especially with the arrival of a healthy child, the support received

from her partner and, finally, the formation or expansion of the social unit called family.[8,13-15]

The "anger" emotion, by its turn, is widely studied in studies addressing mental disorders and any type of violence. On the other hand, when analyzing studies in the field of obstetrics, this emotion is only described in qualitative studies on obstetric violence, reaching the conclusion that pregnant women were unsatisfied with the care they received during childbirth.[7,16-18]

Ekman & Rosenberg[11] claim that "anger" controls, punishes, and retaliates. Thus, how can we imagine "anger" as the most present emotion in all childbirths in this study? How can childbirth be socially exclamatory for being rewarding and joyful, but generate an emotion of dissatisfaction?

This triad of anger that controls, punishes, and retaliates[11] may be better understood through studies on primal health, which evidenced this emotion as the most primitive of human beings, from the beginning of time of the cavemen era.[1,18,19]

Considering that humanity is only possible thanks to the primal and physiological event of childbirth, since nobody is born otherwise, the association that childbirth involves "anger" can be made. For a woman to physiologically consent her child to be born, she needs to rescue her animal side, the mammalian that exists within her body, regardless of her intellectual evolution. Namely, "anger", as a primal emotion, controls the childbirth physiology, to the extent that, due to its intensity, "anger" filters and even prevents the suffering caused by neocortical interferences.[1]

As punishment, "anger" causes pain, the pain that uterine contractions generate by releasing oxytocin and, in its turn, "anger" retaliates making the women expel the child out of themselves. According to these studies on emotions and primal health, it is possible to understand "anger" as the key trigger for the labor stage of expulsion.[1,11]

When analyzing the most frequent emotions in each study group, data revealed that, in the CG, the most predominant emotions were "fear" ($p < 0.0001$), "sadness" ($p = 0.0060$), and "disgust" ($p = 0.0091$). As for the IG, the most predominant were "joy" ($p < 0.0001$) and "anger" ($p < 0.0001$). However, the "surprise" emotion was equally presented in both groups, with averages of 15.13% in the CG and 16.08% in the IG.

These results show that lighting in the delivery room stimulates the emergence of different types of emotions according to its intensity, although the six emotions assessed were present in almost all deliveries.

Within a psychoanalytic approach, a literature review on the impact sadness has on adults revealed and concluded that sadness is passive and the individual involved in this emotion is actually asking mentally and involuntarily to be helped and comforted. Therefore, bringing this information to the obstetric practice under study, the association of sadness being more present in the CG may have been caused by higher exposure of the pregnant women to intense lighting in the delivery room, which physiologists claim to be a source for better evaluation, and which most part of human beings, when feeling monitored and evaluated, tend to act differently.[1,2,7,19-21]

In its turn, "disgust" is the only emotion on which all specialists in the cognitive field have reached a consensus. It is a learned emotion, not inherent to the primal cortex, possibly developed from four years of age on, and influenced by the culture to which each person belongs.[11,19,22]

It is not just about taste, smell and touch, or an idea, a vision or a sound that could cause "disgust", but actions and physical appearances as well. Rozin et al.[23] found that the most powerful universal triggers for the "disgust" emotion are bodily waste products: feces, vomit, urine, mucous, and blood, plus morally pervert social situations, such as pornography and sexual activity.

When evaluating this emotion more present in the CG, lighting can be associated with mind activation and, consequently, the awareness of the pregnant women regarding their own blood, feces, urine, and vomit. These excretions are socially learned as disgusting and the pregnant women may awaken to the scene in which they have been submitted: naked from the waist down, in gynecological position, one or more observers in front of them (professional assisting the childbirth), watching the gloved hands

covered with blood from nurse-midwives, feeling the smell of their own excretions. In addition, they become aware that their companion, who is generally the partner, and all of those present might be watching and experiencing that situation as well.

Qualitative studies also evidenced pregnant women talking about frequent obstetric-gynecological examinations that are still very present in this institution during the stage of expulsion. Disgust can also be unleashed through the perception of the pregnant women, facing the intensity of light in the delivery room, in which digital pelvic examination may lead to the sensation that she has been degraded, especially in this singular moment that is childbirth.[7,17,24,25]

Against the most prevalent emotions in the CG, and also despite the presence of "fear", "sadness", and "disgust", the IG was characterized by higher exacerbation of "joy" and "anger" emotions. The main determinant may be the fact that the low light setting promoted privacy with the activation of the primal cortex, releasing endorphins and oxytocin and, as a result, inhibiting the synapses in the neocortex and the release of adrenaline.[1,21,26]

These facts demonstrate that the presence of "anger" and its essence throughout labor and during the stage of expulsion has been characterized as the key trigger for the stage of expulsion, due to the primal strength nature of this emotion.[11] "Joy" can be associated with the pleasant emotion driven by the arrival of the baby, a dream come true, the patient feeling respected, and having the benefit of privacy provided by the low light setting, which promotes better physiology of the childbirth.[1,2]

It is a consensus among specialists that "surprise" is the briefest of all emotions. It lasts only a few seconds. Therefore, "surprise" lasts while there is an understanding of what is going on and, after that, it gets mixed with other emotions.[3,11]

The striking point in our results was the statistical consistency related to the appearance of "surprise" in both groups, as a very singular characteristic: it serves as a trigger to unchain "anger" in both groups. There is only a time gap from its appearance in the stage of expulsion, as in CG it is present in emotion time 4 and in IG in emotion time 2.

Regarding the six times that emotions appeared, the study assessed that CG was characterized for showing a higher concentration of emotions in the following order: "fear", "surprise/fear", "disgust", "surprise", "anger", and "joy"; whereas IG evidenced the following order: "fear", "surprise", "anger", "joy", "joy". "Joy" obtained statistical significance for time 2 ($p = 0.0277$), time 3 ($p = 0.0022$), time 4 ($p = 0.0016$), and time 5 ($p = 0.0009$).

With these findings, low light settings may be linked to the promotion of a more physiological sequence of emotions, since there is the initial appearance of "fear", which is common to someone who is about to experience an intense moment, such as a childbirth, and because of all the characteristics already mentioned about this emotion, followed by "surprise", which is a transition emotion for the third emotion, "anger". This is the one in this study regarded as the trigger for expelling out the baby. Next, "joy" is more concentrated as an emotion in stage time 4, 5, and 6.

The environment with common and regular lighting, widely practiced, promotes the appearance of a more disturbed sequence of emotions. "Fear" comes first, although without statistical significance when compared to IG, it lingers more than expected, reaching time 2 of emotions, next to "surprise", which is the transition to "anger". Yet, this transition is blocked by the appearance of "disgust", probably due to mind activation and what is socially accepted and pleasant. Nevertheless, as labor evolves, the "surprise" emotion appears again, making the transition to "anger", which accomplishes its role as the trigger for expelling out the baby, and "joy" settles in closing the emotion times.[3]

In this study, it was possible to show that 100% of the deliveries finished expressing the emotion of "joy". Despite its quantitative nature, the results of this study corroborated the qualitative studies in the scientific scenario, which showed phrases expressing satisfaction when the pregnant women see their babies for the first time, in skin-to-skin contact, being able to breastfeed, and acknowledging that all the effort and intensity of pain were worthwhile.[27]

Conclusion

All six emotions (fear, joy, anger, disgust, sadness, and surprise), intentionally put into evaluation, were identified during the stage of expulsion in the delivery room. It has been shown that a low light setting promotes a sequence of emotions that respect and help the physiology of the labor expulsion (fear, surprise, anger, and joy). An environment with common and regular lighting suffers interference in the sequential appearance of emotions, disrupting the physiological process during expulsion (fear, fear/surprise, disgust, anger, and joy).

Collaborators

Silva MG and Shimo AKK contributed to the project conception, data analysis and interpretation, manuscript writing, relevant critical review of its intellectual content, and final approval of the version to be published.

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