Original Article

Music and 25% glucose for preterm babies during the pre-procedure for arterial puncture: facial mimics emphasis*

Maria Vera Lúcia Moreira Leitão Cardoso[1], Gleicia Martins de Melo[2]

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[1] Nurse, Ph.D in Nursing. Full Professor of the Pharmacy, Dental and Nursing Faculty at Universidade Federal do Ceará. Fortaleza, CE, Brazil. E-mail: cardoso@ufc.br.

[2] Nurse, Master in Nursing. Student of the Nursing Graduate Program, Doctoral level, at Universidade Federal do Ceará. Fortaleza, CE, Brazil. E-mail: gleiciamm@hotmail.com.

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ABSTRACT

We aimed to describe and quantify facial mimic movements of preterm babies during music and 25% glucose interventions at the pre-procedure for arterial puncture. A randomized controlled trial involving 48 videos of preterm attended in a public neonatal unit, in Fortaleza – Ceará. We collected data from footage analyses during the pre-procedure. Babies heard a lullaby song for 10 minutes in the experimental group; we administered 25% glucose in the control group at the end of the eighth minute, matching a total of 10 minutes of observation. We assessed the frequency of facial expressions: cry, sneeze, yawn, frown the forehead, focused sight, vague sight, sleeping and head movement. Statistically significant variable for the control group: vague sight (p=0.001) at the two last minutes of observation. We concluded that there was no association between most of facial movements and the studied interventions, except for a vague sight in the control group.

Descriptors: Infant, Newborn; Infant, Premature; Music; Glucose; Neonatal Nursing.

INTRODUCTION

When considering that newborns communicate non-verbally, it becomes necessary to observe physiological and behavioral parameters to better perceive manifestations. Specifically about behavioral parameters, the International Association for the Study of Pain (IASP) considers it to be the only way to assess a newborn (NB) during the neonatal period, once it is easier to observe behavioral asymmetries[(1)].

To be more particular about behavioral manifestation, facial mimic assessment is considered a

substantial tool[2] that is fundamental for newborns, because babies express emotions through their faces very early because other possible ways as verbal communication, are not functioning yet[3]. In this study, we prioritized facial mimic assessment at the pre-procedure moment (PPM), when preterm newborns (PTNB) had not yet been submitted to any painful procedure; represented in our study by the arterial puncture.

Even the considered extreme PTNB give alert signals and communicate with readiness for orientation purposes or to avoid the stimuli given. It can be noted through signs of subtle facial movements, mouth movements, search for suction and affective suction, relaxed face, hands in the mouth, and fixed sight[4].

When verifying the scarcity of emotional/behavioral studies with newborns[3], and that nursing acts with assistive methods more inclined to humanized care, considering that nurses are the closest health professionals to the client, it becomes needed to deepen more in the communicative process of PTNB, through facial mimics, especially of those who are in the neonatal care unit (NCU).

In this context, the use of non-pharmacological measures is advocated, as music and 25% glucose. They can influence in a different way on the number of facial mimic movements of preterm babies. What is known through the pertinent literature is that sounds directly and indirectly affects the body. Sounds act directly through the cells and constituting organs and, indirectly, over the emotions and on the other hand, music produces relaxation, decreases anxiety, reduces the perception of pain, changes mood states, promotes distraction and comfort[5]. Yet, the use of 25% glucose releases endogenous endorphins, decreases crying and attenuates the pain facial mimic[6].

Considering the exposed above, the following question arose and motivated us to develop this study: what are the facial manifestations of PTNB submitted to music and 25% glucose interventions at the arterial puncture PPM? We believe that the answer to this question will contribute with future studies proposed to rethink the attention to PTNB through non-verbal facial mimic communication because it would be possible to demonstrate how PTNBs react to interventions (music and 25% glucose) before pain stimuli. Thus, it would be possible to establish coherent and systematized intervention plans with non-pharmacological measures to humanize attention since the period anticipating pain, that is, the PPM.

Our study aimed to describe and to quantify facial mimic movements of preterm newborns under music or 25% glucose interventions, at the pre-procedure moment of arterial puncture.

METHODS

This is a randomized clinical trial conducted in a NCU of a public hospital, located at Fortaleza, Ceará, Brazil. We received financial support of a larger project from the Brazilian National Council of Scientific and Technological Development (CNPq), Universal Notice 14/2011 n°. 483352/2011-0. The study is connected to the filming database of a Doctoral thesis with published data[7], registered at the Brazilian Registry of Clinical Trials (UTN: U1111-1123-4821), and it was approved by the Ethics in Research Committee from the institution where the study was carried (process nº 060717/11). We respected the ethical aspects foreseen in the Brazilian legislation about studies human beings.

We estimated a sample of 66 PTNBs, from a test power of 80% and significance level of 5%, using the calculation for sample size for experiments comparing non-paired groups.

$$n = \left[\left(\frac{S_a^2}{S_b^2}\right) * \left(\frac{Z_\alpha}{2} + Z_\beta\right)\right]^2$$

Where $\frac{Z_\alpha}{2}$ is the value for alpha error, usually 1.96 (α=5%); Z_β is the value for beta error, usually 0.84 (β=20%) and, S_a^2 e S_b^2, is the standard deviation of group differences.

Considering possible losses during the experiment, we estimated a higher total number for PTNBs, totalizing 20% more than expected, resulting in 90 NBs for both studied groups. We included PTNBs with gestational age of ≥32 weeks and <37 weeks; Apgar ≥6 at the 5th minute; clinically stable with a heart rate (HR) of 120 to 140 bpm and respiratory frequency (RF) of 40 to 60 incursions per minute[8]; normal hearing neonatal test triage; in any type of ventilation support (circulating O_2; Oxi-Hood; Continuous Positive Airway Pressure – CPAP or ventilator intubation).

The data collection occurred with the selection of PTNB's videos from the filming database from the music and 25% glucose groups. From the 55 selected videos, 48 constituted a sample, being 26 in the Experimental Group (EG – music); and 22 in the Control Group (CG – 25% glucose).Videos met the following inclusion criteria: faces that could be analyzed without difficulty during the 10 minutes of PPM of arterial puncture for the two groups; excluding videos with issues on image synchronizing and difficulty to see the face. Considering babies who used CPAP, we excluded those with inadequate prong size and fixation covering the face.

PTNBs were recorded with a digital camera directed to their face. After, all PTNBs from the EG used headphones to listen to a lullaby song during 10 minutes, through a MP4 connected to the headphone. Participants from the CG also used headphones (with no music), and 2ml of oral 25% glucose solution was administered at the end of the 8th PPM minute, separated in a 3ml syringe, by a string of gauze.

A nurse coded the number of facial mimic movements contained in the form, using the videos in an individual computer, after the assessor reliability had achieved a minimum Kappa of 80% during training before data collection in the research nucleus which this study belongs to. It is important to clarify that the referred nurse received a DVD with the PTNB number corresponding to the face and to the data collection instrument with the time to be assessed, according to Figure 1, and that because of the type of intervention, did not remained blinded to groups.

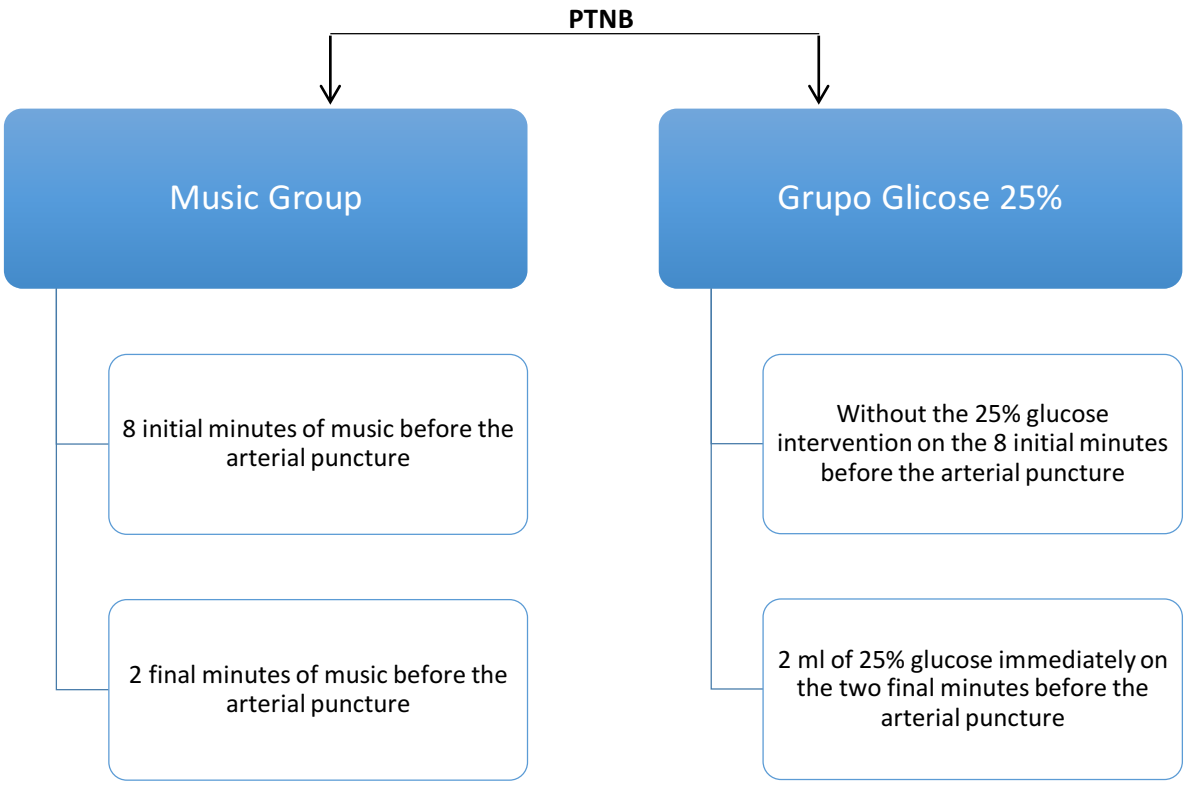

Figure 1: Summary of 10 minutes of the pre-procedure moment for studied groups. Fortaleza, CE, Brazil, 2013.

Consultations in the database of information obtained through medical records of PTNB hospitalized at NICU provided the following data: gender, type of deliver, weight at birth, Apgar 1' and 5', corrected gestational age (GA), chronological age (CA), place of hospitalization, type of oxygen therapy and, medical diagnosis.

The form used to register the number of facial mimic includes facial movements (cry, sneeze, yawn, frown the forehead, focalized sight, vague sight (PTNB with a distant/inexpressive sight), sleep and, head movement. The form scored zero when there was not and, one when there was a manifestation.

The mimic coding was conducted continuously, second by second, during 10 minutes at PPM, divided in two blocks of time, eight initial minutes and two final minutes, for each footage of the EG and CG (Figure 1).

Each observed action of facial mimic was registered as present on the instrument. PTNBs were analyzed with audio in cases when they were crying, and without audio for other manifestations. The videos were watched as many times as needed, so that every movement or expression was identified and registered without missing the number of movements. Posteriorly, we added each frequency of observed movements for each premature baby for the two moments of assessment.

Initially, we structured the database on an Excel (version 2007) spreadsheet to code variables and, we double entered data to guarantee data reliability. After comparing the two spreadsheets and corrections of differences, we exported the data to the software Statistical Package for the Social Sciences – SPSS (version 19).

We used descriptive statistics (mean and standard deviation) to analyze quantitative variables, and we used ANOVA to compare means for comparison between groups regarding the indicator of behavioral characteristics (face). We considered 5% as level of significance for all these tests ($p<0.05$).

RESULTS

The average weight at birth was 2.136g (SD = 627.4) for the EG and, 1.868g (SD=485.7) for the CG; mean Apgar at 1' for EG and CG was 6.8 (SD =1.9) and 6.4 (SD=2.2), respectively. At Apgar 5', there was an increase in means per group, respectively of 8.5 (SD=0.8) and 8.3 (SD=0.8). Male gender was predominant in the EG, 16 (61.5%) and 15 (68.2%) in the CG; prevalence of cesarean section was 19 (73.1%) at the EG and 17 (77.3%) at the CG.

The mean GA in weeks varied, respectively 34.3 weeks (SD =1.6) for the EG and 33.7 weeks (SD=1.6) for the CG. Regarding CA in days at the PPM of arterial puncture, most were at their first day of life (12h) for the EG with 1.96 (DP=4.8) and 3.1 (DP 8.5) for the CG.

Most PTNBs were hospitalized at the high risk unit: 24 (92.3%) from the EG and 17 (77.3%) from the CG; about the use of nasal CPAP, 38.5% from the EG and 36.4% from the EG were using it. When investigating the medical diagnoses for hospitalization, we saw a prevalence of Respiratory Distress Syndrome (RDS) +prematurity in 15 (57.7%) babies of the EG and 12 (54.6%) of the CG. Other present diagnoses were: prematurity + Intra Uterine Growth Retardation (IUGR) for one (4.5%) baby from the CG, and RDS + prematurity + Large for Gestational Age (LGA) for one baby (3.8%) from the EG.

Tables 1 and 2 present the number of facial mimic movements in premature babies at PPM in both groups at the initial 8 minutes and at the last two minutes.

Table 1: Number of movements, mean, standard deviation of PTNBs at the initial eight minutes during pre-procedure, according with allocation groups and respective *p* values. Fortaleza, CE, Brazil, 2013.

Facial reactions	Experimental Group (n=26)			Control Group (n=22)			*P** Value
	Nº mov.	Nº PTNB	$\bar{X}$±SD	Nº mov.	Nº PTNB	$\bar{X}$±SD	
To cry	4	2	0.2±0.2	16	3	0.7±1.2	0.288
To frown the forehead	57	17	2.2±0.5	50	13	2.3±00	0.923
Focused sight	4	3	0.2±0.1	8	3	0.4±0.8	0.362
Vague sight	12	6	0.5±0.2	28	8	1.3±2.7	0.106
Sleeping	24	24	0.9±0.1	21	21	1.0±0.2	0.662
Head movement	46	19	1.8±0.4	71	12	3.2±1.2	0.273

* ANOVA comparison of means ($p<0.05$)

Table 2: Number of movements, mean, standard deviation of PTNBs at the two final minutes during pre-procedure, according to allocation group and respective *p* values. Fortaleza/CE, 2013.

Facial Reactions	Experimental Group (n=26)			Control Group (n=22)			*P** Value
	Nº mov.	Nº PTNB	$\bar{X}$±SD	Nº mov.	Nº PTNB	$\bar{X}$±SD	
To frown the forehead	20	12	0.8±0.2	9	7	0.4±0.1	0.166
Focused sight	1	1	0.0±0.0	2	2	0.1±0.1	0.465
Vague sight	-	-	-	7	7	0.3±0.1	**0.001**
Sleeping	27	25	1.0±0.0	25	21	1.0±0.0	0.906
Head movement	16	19	0.6±0.1	22	12	1.0±0.4	0.314

* ANOVA comparison of means (p<0.05)

We did not observe the presence of sneeze or yawn in any preterm baby from both groups, during the two observation moments (Tables 1 and 2). We verified the absence of crying reactions on both groups and vague sight on the EG (Table 2).

Regarding facial reactions of PTNBs on the two final minutes of PPM, vague sight was not registered on the EG while the mean on the CG was 0.3±0.1 movements, presenting statistical significance (p=0,001).

DISCUSSION

The main finding of this study is that in both groups, music and 25% glucose, we observed a decrease of facial mimic movements in all manifestations when comparing the first assessment moment with the second. It is important to note that no studies explored influences of the combination of these non-pharmacological interventions on the behavioral facial response in preterm babies without pain, through the studied facial reactions.

In the present investigation, it is believed that there were no stress stimuli in PTNBs exposed to music and 25% glucose interventions, considering that we did not observe the presence of yawn and sneeze in any preterm baby and cry was seen in five (10.4%) on both groups at the first eight minutes of observation, being two (40%) on the EG and three (60%) on the CG. In addition, we identified presence of movements as the ability to see for a short period of time and, mouth movement, which are indicated as newborn stability in the scientific literature[9].

Similarly to these reactions indicating newborn stability, an exploratory study investigated how much professionals from neonatal intensive care unit (NICU) identified neuro-behavioral signals (quantity of stimulation and adequate interaction by the unit professional) presented by PTNBs, through a checklist of the Assessment of Preterm Infant's Behavior. Results revealed that tong extension, hand to face, body movements, hand to mouth, to suck and, to bite were the most evident approximation signals. Besides, the signals of fix sight and rounding of the lips were seen in smaller proportions[10].

About the variable cry, which was seen only at the first eight minutes before the procedure, although it is an indicative that something wrong is happening[11], it still deserves attention because caregivers interpret it in many ways[12]. A study about communication between the mother and the NB hospitalized in the NICU, with 20 mothers and 20 newborn babies during the visitation, it was seen that facial expressions

oscillated between cry (13) and tranquility (7) [9].

Another study reflected about a facet of the mother-baby relationship, present in the creative use of the mother's singing voice during the communication with her baby, submitted to eight body therapy sessions during an average of one hour and thirty minutes per session. It was seen that after the fourth session, the child stopped the crying, creating tranquility for the mother and child[13].

Highlighting the CG intervention, a clinical trial with 113 newborns randomized to receive 2ml of breastmilk (experimental group) and 2ml of 25% glucose (control group) two minutes before the calcaneal puncture for pain relief, Premature Infant Pain Profile (PIPP) scores were significantly lower ($P<0.02$) for the group that received 25% glucose in comparison to the group that received breastmilk. There was a lower incidence of cry ($p = 0.001$) and cry duration ($p = 0.014$) for newborns from the control group[14].

Referring to indicative behavioral signals of giving a pause until the NB is re-established due to provoked stress or stimulus, they are: regurgitating, to have nauseas, to make faces, to yawn, to cough, to frown the forehead, to sneeze and to sigh[10].

About the most evident facial reactions of PTNBs in this study, results revealed frowning the forehead (57) and to sleep (27) for the EG, and head movement (71) and to sleep (25) for the CG on the initial eight minutes and on the last two minutes of observation, respectively.

It is important to note that although PTNBs from the EG frowned more the forehead, this finding cannot be used as an index of painful phenomenon, once pain is expressed in a more complex way. In addition, we observed more premature babies with appearance to be sleeping, demonstrating apparent adaptation with the music during the two final minutes.

A study with mothers about their baby's behavior and reaction when submitted to lullaby listened by her during pregnancy and delivery, it was evident that newborns recognize sounds when calming down and sleeping, apparently attentive to melodies, and sometimes, in a selective way[15].

Referring to head movement of babies from the CG, it is known that during the neonatal period, newborns prefer to turn and keep their heads for one of the sides, and the contact of the hand with the face or mouth is higher on the side to which the head is turned[16]. We noted that during the administration of 25% glucose at the last two minutes, we saw a higher number of movements of babies that appeared to be sleeping; although with the same number of preterm babies at the initial eight minutes, indicating that the glucose solution acted facilitating the relaxation of the facial mimic and accommodation.

A descriptive study investigated the behavioral manifestations of PTNBs hospitalized in high risk neonatal units after 20 minutes of capillary glycaemia, orogastric catheterization, nutrition by tube, administration of intravenous medication, temperature checking and, diaper change. It was seen a predominance of deep sleep, hyperextension, elevation of lower limbs and, opening toes, as behavioral manifestations. It was also seen crying, frowning the forehead, to make faces, movement/torsion, hypertension and agitation [17]. The results from this study showed similarity in some manifestations found for both music and 25% glucose groups.

Assessing the number of facial mimic movements at the final two minutes of observation, we saw that reactions which least appeared were focused sight (open eyes), at the EG as well as in the CG, and a large part of preterm babies seemed to be sleeping. Regarding vague sight, there was statistical significance (p=0.001) at the last two minutes favoring the EG once this expression was not seen on the CG, even this one being common among newborns because they do not have the ability to focus their sight. Therefore, we consider that new studies should be conducted with large sample sizes for manifestation of vague sight in newborns under the use of music and 25% glucose. It is highlighted that music has a therapeutic action in the human body-mind, it elucidates emotions, propitiates physical and mental relaxation[18], it is an important allied for treatment alternatives, especially when used as intervention instrument in behavioral and emotional processes[19].

An experimental study conducted at a NICU in a hospital institution in Vancouver, Canada with 54 PTNBs, compared if 19 listed movements at the Newborn Developmental Care and Assessment Program (NIDCAP) differed regarding its frequency during the conduction of calcaneal puncture in two distinct situations, isolated or grouped with other procedures. In the first situation, newborns demonstrated a higher number of face torsions, and in the second situation, sneezes and yawns were more frequent. The recovery phase (after the painful procedure), was also assessed and it was seen that the frequency of the vague sight expression (t=-2.98, p<0.004) was statistically significant and higher when adopting the grouping care[20].

Based on these inferences and believing that music and 25% glucose administration at the PPM of arterial puncture favored relaxation and accommodation of facial reactions in PTNBs hospitalized at the NCU, such interventions should be incentivized to improve quality of life of preterm babies.

CONCLUSION

Newborn babies from both groups (EG and CG) were accommodated and tranquil, not demonstrating discomfort with the administration of non-pharmacological interventions. There was a significantly statistical difference favoring music for neonates that presented a vague sight (p = 0.001), at the last two minutes of observation.

In this segment, we believe that the present study contributed with the elucidation of important aspects related to the number of PTNB's facial mimics. Thus, we expect our results to offer subsidizes for a more humanized assistencial practice, with nursing professionals committed to improve the quality of life of premature babies hospitalized at NCU and to use non-pharmacological measures, as music and 25% glucose.

Within limitations in the study, we highlight the absence of a group with term NBs to compare the number of facial mimics with PTNBs submitted to music and/or 25% glucose intervention. Future studies attending such limitations are needed.

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