INVESTIGATION OF AN ALIMENTATION SYSTEM IN PREMATURE NEWBORNS FROM GUSTATORY STIMULATION

Investigação de um sistema de alimentação em recém-nascidos prematuros a partir de estimulação gustativa

Andréa Monteiro Correia Medeiros[1], Conceição Lima Alvelos[2], Thalyta Prata Leite de Sá[3], Alana Dantas Barros[4], Oscar Felipe Falcão Raposo[5]

ABSTRACT

Purpose: to investigate the existence of the alimentation system in premature newborns in response to gustatory stimulation. **Methods:** experimental, analytical, double-blind study. 90 premature newborns of a public maternity in Sergipe took part in the test which was filmed and divided into three parts of five minutes. In the first and last, there was no stimulus; in the second, the gustatory stimulation was applied and the newborn children were divided into two groups (water or sucrose). We studied the specific behaviors suction right and left hands, tongue protrusion and suction movements in behavioral states deep sleep, light sleep, drowsy, restless / irritable and crying. In the statistical analysis of the population, average, standard deviation and prevalence studies were performed. We used the non-parametric Mann-Whitney test to compare averages. The Spearman test observed correlation between behavioral states at each time of the test. The p value was significant when less than 0.05. **Results:** independent of the given stimulus, the correlation increased in all specific behaviors. Comparing the groups separately, after stimulation, we observed an increase in correlation in right hand suction and tongue protrusion for both. The same happened in suction, except for the agitated/irritated state. After stimulation, there was a higher correlation to the behavior of left hand suction in the sucrose group when compared to water. The results show that gustatory stimuli may contribute to the readiness to feed this population. **Conclusions:** it was found in premature newborns an increased in correlation for the specific behaviors related to the alimentation system after oral stimulation, which envisions the possibility of gustatory stimulation be used for activating a alimentation system in premature newborns.

KEYWORDS: Speech, Language and Hearing Sciences; Feeding; Infant, Newborn; Infant, Premature; Sucrose

INTRODUCTION

For several years the theoretical assumptions that guided the research on development and human behavior, brought with them to design the newborn as a being without skills or abilities. In this sense, refers to the existence of Thoman[1] some myths about childhood, including newborn (NB) human being deemed deficient at birth, incomplete, immature and unfinished being seen essentially reflection mode and no ability to learn and socializing.

In contrast, when the holistic, humanistic, researches[2,3] assumptions are adopted studies on the development began to seek to understand the organization of social and biological behavior of human beings, from a variety of events, where the RN responds to environmental and social stimuli, being influenced and influencing the environment in which they live. This assumption, the human being has a wide behavioral repertoire at birth and

(1) Núcleo de Fonoaudiologia da Universidade Federal de Sergipe, São Cristóvão, SE, Brasil.

(2) Núcleo de Fonoaudiologia da Universidade Federal de Sergipe, São Cristóvão, SE, Brasil.

(3) Núcleo de Fonoaudiologia da Universidade Federal de Sergipe, São Cristóvão, SE, Brasil.

(4) Núcleo de Fonoaudiologia da Universidade Federal de Sergipe, São Cristóvão, SE, Brasil.

(5) Departamento de Estatística e Ciências Atuariais da Universidade Federal de Sergipe, São Cristóvão, SE, Brasil.

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has learning abilities and social interaction in an extremely early age.

From this perspective scholars[4] started to defend the specific behaviors evidenced in the newborn, are part of specific functional systems that make explicit certain skills and abilities of the human being, in a period of extremely early life.

These same authors[4] still consider that behaviors can be identified as 'actions' much more than 'answers' or mechanical 'reflexes', requiring a more complete understanding of the functional specificity of child behavior. These behaviors are seen as belonging to a group of 'action systems', which are defined by the hypothetical function as intended, fulfilling certain functions of survival for humans, such as food and protection[2].

The system related to food action would be demonstrated by the ability to recognize the given taste stimulus given to the RN, put his hand to his mouth and still coordinate sucking movements and breathing, to suck it[2,5]. These behaviors, relating to "feeding system", in turn, are related to the development of speech structures and coordinate the functions of swallowing, sucking and breathing and can be influenced by internal and / or external[5] factors, such as the gustatory stimuli.

The gustatory stimulation has been used with newborns, since the assumption that the gustatory capacity already got their start in the early experiences of intrauterine life, since the development of taste buds occurs in early stages[6], allowing that the fetus already has the ability to feel the taste of amniotic fluid.

In this sense, Medeiros[2] used sucrose as gustatory stimuli in newborn terms to discuss the existence of a feeding system from the moment of birth.

The knowledge on the supply system could increase the basis in speech therapy in breastfeeding promotion, from the differentiated interpretation of behaviors of readiness to breastfeed presented by RN.

Strategies to promote breastfeeding are important to ensure the survival of the human species, since this favors immunity, digestion and absorption of nutrients[7-20], but above all, in the speech area, this promotion may aid the development of the structures of the sensorial system motor oral (lips, tongue, cheeks, hard and soft palate), providing a better functioning of the functions stomatognatics[21-24].

The feeding system has already been evidenced in newborns terms by Medeiros[2], as related to neurologic status and important in readiness for food. Therefore intend to investigate the feeding system in preterm infants, a population that often presents with feeding difficulties in the neonatal period.

Some authors[25,26] describe premature birth as a risk factor for abnormal neurodevelopment and functional capabilities. In this sense, considering that the ability to supply is achieved concurrently with the development of the central nervous system (CNS)[27], the changes that occur in preterm newborns could even disrupt the normal course of development of feeding.

The literature[28] indicates that the introduction of oral feeding in premature newborns may be performed from 34 weeks on the gestational age, when the sucking pattern matches with these babies of term. Thus, it is necessary to investigate whether there is a feeding system developed in such an early age already.

Thus, the aim of this study was to investigate the existence of the feeding system in preterm infants from the gustatory stimulation (sucrose for analysis - PA 12% or water).

METHODS

This is an experimental, analytical, double-blind study performed in a public hospital in Aracaju (SE) of 90 preterm infants of both sexes, hospitalized in rooming. The inclusion criteria for this study were: clinically stable at the time of the test, Corrected Gestational Age (CGA) of up to 36 weeks and one day old, with an average of 34.92 days (Standard Deviaton of 1.05 days) and intrauterine growth curve Suitable for Gestational Age (SGA). Subjects who used respiratory support, were excluded from this study, showed significant clinical history of neurological or cardiac complications and were suffering from syndromes and / or diagnosed malformations or still to be clarified.

Initially we had to select the RN and then the signing of the consent form. Each newborn was placed in carry-cot, in the supine position, with naked torso and upper limbs. The newborns were divided into two groups (water or sucrose for analysis 12%), being filmed in the crib by attached digital camera on a tripod, so the face and upper limbs stay framed in the video.

It is important to mention that this study followed the same methodological design conducted in the thesis of doctoral degree of Medeiros[2] with newborns terms, particularly in relation to the testing procedure as well as the characterization of behavioral states and specific behaviors studied.

One of the researchers was responsible for the double-blind procedure, randomly distributing the substances water or sucrose in vials, which were numbered. For female newborns were used even bottles and males, the odd vials. The administration of sucrose solution or water was taken by other

researchers who were unaware of the solution administered (double-blind procedure). The vials were randomly selected at the moment of the shooting. Randomization was performed in the draw of bottles for their newborns until all vials had been selected.

Besides the procedure (test itself) for data collection, the researchers studied the medical records of infants and mothers, recording on a specific protocol the following data: RN gender, Gestational Age at Birth (GAB), Corrected Gestational Age (CGA), birth weight, lifetime, Apgar scores (1stand 5thminutes), full name and age of mother, type of birth, date and time of the test.

It is noteworthy that there was previously a conduction of a pilot study so that the researchers would train the execution of the procedure, provided being the judges themselves would also analyze the videos (behavioral states and specific behaviors) reliably. Thus, the calibration procedure of the judges, which were analyzed together some videos of the pilot was conducted.

To analyze the videos of the 90 infants who participated in this research, each video was watched by three different and independent judges, establishing to themselves as a criterion of agreement between them, only the behaviors displayed by at least two judges.

The observation of the variables was based on the following classification:

1. Behavioral States[2,29]

a. Deep Sleep (DS): regular breathing; eyes closed without the presence of nystagmus; absence of spontaneous motor activity.

b. Light Sleeper (LS): irregular breathing; eyes closed with movement; possible occurrence of eye opening; low level of motor activity.

c. Sleepy (SL): generally open eyes (blurry) with heavy lids, trembling and / or closed eyelid; level variable and mild spontaneous motor activity.

d. Alertness (AL) eyes open (look shiny) or closed with sharp activity concentration; low level of overall motor activity.

e. Agitated / irritated (AG / IR): open or closed (tight) eyes; high level of motor activity, with impulsive movements of the extremities. Possible occurrence of grunts and vocalizations.

f. Crying(CR): eyes closed (tight); high level of physical motricity; presence of shock and / or tremors; presence of intense crying.

2. Specific Behaviors[2]

a. Right hand suction, right (RHS) and left (LHS): Contact one of the hands or both on oral region along with sucking movements; there may or may not tongue protrusion; frequent rhythmic movements in the oral region (cheeks) and the protrusion and retraction of the mandible.

b. Tong Protrusion (TP): not necessarily occluded lips; visualization of the apex of the tongue between the upper and lower lips; existence of movement of the tongue in the posterior-anterior direction.

c. Suction movements (SU): occluded or narrowed (rounded) lips; viewing retraction of the angle of the mouth, the region corresponding to the action of the muscle; rhythmic movements are often observed in the oral region (cheeks); there may or may not protrusion and retraction movements of the jaw.

It is understood by oral region[2] for the purpose of recording and analysis: lips, oral cavity, tongue, and floor of the mouth cavity.

Frequencies of behavioral states and specific behaviors were recorded in SPSS (version 18, 2008, Chicago, Illinois, USA) software. Counted up each behavioral state and each specific behavior, second by second, the exact time of occurrence, the total amount of times being calculated as these behaviors appeared.

For CGA fractions of the week were used to calculate the sundry days (1 week = 0.14 days).

The project in question was approved by the Ethics Committee on Human Research from the origin Institution under paragraph CAAE 0027.0.107.000-11.

Correlations in statistical treatment of all RNs were made, regardless of the stimulus administered, and in the two groups separately. Measures of central tendency (average), variability (standard deviation) and prevalence (absolute and relative) form used to characterize the population. To test the normality of the data was made the Shapiro-Wilk test. Due to lack of normality nonparametric Mann-Whitney test for comparison of average was used. The Spearman correlation test was used to verify the correlation between behavioral states and specific behaviors in each time of testing. Values between 0.1 and 0.3 was considered poor correlation; moderate between 0.4 and 0.6; strong above 0.7, and ideal when equal to 1,0[30]. The p values less than 5% ($p < 0.05$) was considered significant.

Baby, mother and the test Data Protocol		
BABY DATA		
Baby nº:	Gender: F ( ) M ( )	Coth:
Birth Date:	Birth Time:	
GA:	GA (P.E):	IGC:
Birthweight:	Apgar 1st min. _____	5th min. _____
Kinds of Birth: ( ) normal	( ) caesarean ( ) AGA	( ) SGA ( ) LGA
MD Diagnosis:		
Kinds of Feeding: ( ) GPR (orogastric probe) ( ) NGP (nasogastric probe) ( ) OVON (oral via – baby bottle toorthodontic nipple) ( ) VOBC (oral VIA – baby bottle to normal nipple) ( ) Glass ( ) Breastfeeding		
Time gaps between the baby feedings:		
MOTHER´S DATA		
Mother´sName:		
Birth Date:		Age:
Phone:		
MOTHER ( ) Right-handed	MOTHER ( ) Left-handed	MOTHER ( ) Ambidexterous
FATHER ( ) Right-handed	FATHER ( ) Left-handed	FATHER ( ) Ambidexterous
TEST DATA		
Date of test: ____/___/____	Time of test: Beginning _____	Finish _____
Consciousness State of the baby at the beginning of the test :		
Last Time of breastfeeding (according to the prompt-book):		
Last Time of breastfeeding (according to the mother):		

Caption: GA: Gestational Age; GA (P.E): Gestational Age at the physical exam; CGA: Corrected Gestational Age; AGA: Adequate to Gestational Age; SGA: Small to Gestational Age; LGA: Large to Gestational Age.

Figure 1 - Baby, mother and the test Data Protocol

RESULTS

Were studied 90 preterm infants, whose characteristics were observed: 48.9% male and 51.1% female, birth weight average of 2.11 grams with Reliability Index 95% (R.I.95%) ranging from [2.02, 2.21], CGA average of 34.91 weeks with R.I 95% ranging from [34.69, 35.14] and GAB (physical examination) of 34.10 weeks with R.I. 95% ranging from [33.73, 34.49]. According to the types of stimuli that were given, the newborns were divided into two groups: water (46 subjects) and sucrose (44 subjects).

The specific behaviors studied were observed in each behavioral state and in every moment of the test.

The following results refer to the most significant findings, it is considering the RNs in total (water and sucrose group together), or separately, group water and sucrose group.

No newborn behavioral state was in deep sleep (1), then there is no correlation for this state.

When RNs were analyzed together, regardless of the given stimulus (water or sucrose), the specific behavior right hand suction (RHS) showed a strong correlation only in sleepy (3) and poor behavioral state in alertness (4) before stimulation in BL1. After stimulation, the BL2, this behavior showed a strong correlation in the behavioral states of light sleep (2) and agitated/irritated (5) and moderate correlation in sleepy states (3) and alertness (4). As for the specific behavior left hand suction (LHS), it was noted weaker correlation values in BL1 than BL2 (TABLE1).

Treating the groups separately, the specific behavior of suction right hand (SMD) in the water group showed only a weak correlation in the alert

Table 1 - Correlation between specific behaviors of RHS and LHS and behavioral states at each time of testing, regardless of the stimulus

Stimulus	B.S.	BL1	Drop 1	Drop 2	Drop 3	Drop 4	Drop 5	BL2
RHS (Water And Sucrose)	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,000	0,000	0,703*	0,000	0,000	0,000	0,703*
	3	0,747*	0,000	0,000	0,643*	0,783*	0,437*	0,457*
	4	0,294*	0,530*	0,561*	0,386*	0,414*	0,393*	0,695*
	5	0,000	0,000	0,000	0,000	0,571*	0,584*	0,812*
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000
LHS (Water And Sucrose)	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,000	0,000	0,584*	0,584*	0,000	0,584*	0,802*
	3	0,000	0,000	0,000	0,000	0,711*	0,711*	1,000*
	4	0,663*	0,344*	0,478*	0,633*	0,736*	0,478*	0,607*
	5	1,000*	0,000	0,000	0,000	0,000	0,000	0,000
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000

*Statistically significant values for the Spearman correlation test (p<0,05)
Caption: B.S= behavioral states; 1= deep sleep; 2= light sleep; 3= sleepy; 4= alertness; 5= agitated/irritated; 6= crying; BL1= initial base line; BL2= final base line.

state BL1 (4) and strong correlation in BL2, the alert states (4) and agitated/irritated (5). In the sucrose group, there were strong correlation in BL1 in Sleepy (3) behavioral state and weak in the alert (4), but the BL2 moderate correlation in 3 and 4. The specific behavior of the left hand suction (LHS) observed the group sucrose strong correlation in BL2 on 2, 3 and 4. Already in the water group, the correlations of these behavioral states dropped in BL2 (TABLES 2 and 3).

Table 2 - Correlation between the specific behavior of RHS and behavioral states at each time of testing, stimulated with water or sucrose

Stimulus	B.S.	BL1	Drop 1	Drop 2	Drop 3	Drop 4	Drop 5	BL2
Water	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,000	0,000	0,699*	0,000	0,000	0,000	0,000
	3	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	4	0,365*	0,534*	0,382*	0,535*	0,464*	0,395*	0,783*
	5	0,000	0,000	0,000	0,000	0,564*	0,590*	0,807*
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Sucrose	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	3	0,716*	0,000	0,000	0,655*	0,793*	0,425*	0,468*
	4	0,216*	0,533*	0,649*	0,238	0,379*	0,389*	0,652*
	5	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000

* Statistically significant values for the Spearman correlation test (p<0,05)
Caption:B.S= behavioral states; 1= deep sleep; 2= light sleep; 3= sleepy; 4= alertness; 5= agitated/irritated; 6= crying; BL1= initial base line; BL2= final base line.

Table 3 - Correlation between the specific behavior of LHS and behavioral states at each time of testing, stimulated with water or sucrose

Stimulus	B.S.	BL1	Drop 1	Drop 2	Drop 3	Drop 4	Drop 5	BL2
Water	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,000	0,000	1,000*	1,000*	0,000	1,000*	0,000
	3	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	4	0,535*	0,000	0,659*	0,462*	0,491*	0,493*	0,340*
	5	1,000*	0,000	0,000	0,000	0,000	0,000	0,000
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Sucrose	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,000	0,000	0,000	0,000	0,000	0,000	1,000*
	3	0,000	0,000	0,000	0,000	0,715*	0,715*	1,000*
	4	0,741*	0,438*	0,315*	0,752*	0,882*	0,488*	0,759*
	5	1,000*	0,000	0,000	0,000	0,000	0,000	0,000
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000

* Statistically significant values for the Spearman correlation (p<0,05)
Caption:B.S= behavioral states; 1= deep sleep; 2= light sleep; 3= sleepy; 4= alertness; 5= agitated/irritated; 6= crying; BL1= initial base line; BL2= final base line.

Considering the RNs in full, ie, independent of the stimulus have been given water or sucrose, the specific behavior of tongue protrusion (TP) observed that already exists moderate and strong correlation in BL1. However, this correlation is even stronger during and after stimulation (BL2) in alertness (4) (TABLE 4).

Table 4 - Correlation between the specific behaviors of TP and SU and behavioral states at each time of testing, regardless of the stimulus

Stimulus	B.S	BL1	Drop 1	Drop 2	Drop 3	Drop 4	Drop 5	BL2
TP (Water And Sucrose)	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,594*	0,620*	0,582*	0,577*	0,596*	0,589*	0,766*
	3	0,704*	0,344*	0,433*	0,534*	0,265*	0,429*	0,608*
	4	0,693*	0,708*	0,753*	0,698*	0,699*	0,692*	0,772*
	5	0,798*	0,439*	0,361*	0,472*	0,596*	0,494*	0,740*
	6	0,000	0,000	0,000	0,000	0,000	0,000	1,000*
SU (Water And Sucrose)	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,683*	0,664*	0,712*	0,697*	0,754*	0,726*	0,787*
	3	0,475*	0,544*	0,650*	0,763*	0,682*	0,510*	0,865*
	4	0,507*	0,666*	0,694*	0,727*	0,698*	0,716*	0,625*
	5	0,650*	0,572*	0,525*	0,260*	0,394*	0,476*	0,580*
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000

*Statistically significant values for the Spearman correlation(p<0,05)
Caption:B.S= behavioral states; 1= deep sleep; 2= light sleep; 3= sleepy; 4= alertness; 5= agitated/irritated; 6= crying; BL1= initial base line; BL2= final base line.

When the water and sucrose groups were analyzed separately for the TP behavior in sucrose correlation became stronger in B2 in most behavioral states. In the Water group this also occurred, with the exception of drowsy state (3) in BL2 had a lower correlation than in BL1.

Considering the total RNs, stimulated with water or sucrose, for the specific suction behavior (SU), the behavioral states of light sleep (2) sleepy (3) the correlation was changed from moderate to strong in the BL1to BL2 (TABLE 4).

In the analysis of the two groups separately (water and sucrose), was observed in behavioral states light sleep (2) sleepy (3) that the SU behavior both in water and in the sucrose group, showed a change from moderate to strong correlation in BL1 in BL2. In the sucrose group BL2 in behavioral alertness (4), this behavior reached higher value than in the water group, however, the busy / angry behavioral state (5) came out strong to moderate correlation in the BL1 BL2 (TABLE 5).

Table 5 - Correlation between the specific behavior of SU and behavioral states at each time of testing, stimulated with water or sucrose

Stimulus	B.S.	BL1	Drop 1	Drop 2	Drop 3	Drop 4	Drop 5	BL2
Water	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,645*	0,612*	0,709*	0,714*	0,750*	0,868*	0,772*
	3	0,471*	0,000	0,000	0,494*	0,000	0,448*	0,723*
	4	0,427*	0,588*	0,702*	0,741*	0,653*	0,683*	0,581*
	5	0,565*	0,624*	0,468*	0,395*	0,618*	0,743*	0,654*
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Sucrose	1	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	2	0,666*	0,692*	0,726*	0,693*	0,750*	0,678*	0,788*
	3	0,450*	0,613*	0,745*	0,806*	0,762*	0,541*	0,901*
	4	0,578*	0,732*	0,704*	0,741*	0,741*	0,737*	0,668*
	5	0,715*	0,537*	0,572*	0,000	0,000	0,000	0,517*
	6	0,000	0,000	0,000	0,000	0,000	0,000	0,000

* Statistically significant values for the Spearman correlation($p<0,05$)
Caption:B.S= behavioral states; 1= deep sleep; 2= light sleep; 3= sleepy; 4= alertness; 5= agitated/irritated; 6= crying; BL1= initial base line; BL2= final base line.

DISCUSSION

The data presented here will be discussed considering that the feeding system can be evidenced by some specific behaviors performed by the newborn (hands suction, tongue protrusion and sucking movements) from gustatory stimulation, as proposed by Medeiros[2] in newborn born healthy and terms.

Regarding the ability of discrimination of gustatory stimuli, it aims to be discussed according to the analysis of specific behaviors displayed by newborns against different flavors (water and sucrose). Moreover, the answers provided should also be understood as influenced by behavioral state that the baby was at the time of stimulation.

Sucrose is widely used as non-pharmacological measure to control pain[9-11] and although this is not the purpose of this study, it is worth mentioning the fact that the Ministry of Health[7] propose the use of this substance in its protocols, somehow could facilitate the indication the pleasurable gustatory securely, since we already were attested to in the statement characterized population.

However, the interest in this work is to highlight aspects of gustatory stimulation as a means of observing the feeding system at an early age, contributing even to elicit responses more readily to the situation of breastfeeding.

However, given the scarcity of studies on the subject, the results obtained with premature newborns are discussed here, especially from the findings obtained with newborns terms studied by Medeiros[2], which investigated the existence of a feeding system in first 36 hours of life.

By observing the results found in this study, from the administration of the taste stimulus, whether this be water or sucrose, it is perceived that there is clearly stronger correlations in BL2 for specific behaviors: right hand and left hand suction (RHS and LHS, respectively). This finding corroborates the literature[2], which states that the taste stimulus in the oral region triggers the execution of sucking movements.

The correlations in specific behavior right hand suction (RHS) showed increasing when water and sucrose groups were considered separately. Thus, unlike the data presented in literature[2] with newborns terms, the population studied here (premature) water also significantly increased the correlation of this behavior, although not one taste stimulus considered as effective as sucrose.

For the behavior of suckling the mothers, the fact that there were no significant differences that occur between groups of stimuli (water and sucrose) in this population born with GA average of 34.10 weeks and tested with an CGA average of 34.91 weeks makes that the data do not corroborate with that studies[6] indicate that the intrauterine period the fetus already has gustatory discrimination and preference.

On the other hand, the correlations increased after gustatory stimulation in both groups, which may demonstrate that independent from stimuli, gustatory stimulation is an important conduit for readiness to activate the feeding behavior, such as suction movements, which are fundamental for the effectiveness of feeding, especially within the breastfeeding[31].

Considering the behavior of hand suction as indicative of readiness to feed and related to a feeding system, the sucrose group, the correlation increased sucking behavior of the right hand in alertness and reduced in drowsy state, as well as increasing correlation of specific behavior of left hand suction, also in alertness, corroborates the literature[2,32,33] which states that the sucrose elicits specific behaviors of readiness for food, especially in behavioral state considered ideal (alert) to occurrence of behaviors readiness to breastfeeding[7,8].

By analyzing the behavior of tongue protrusion (TP), independent of the administered stimulus (water or sucrose) was more evident in alertness (4) after stimulation, as occurred in the behavior of hand suction, actually evidenced that the conduct of readiness to breastfeeding[7,8] are more incidents in alertness.

Thus, one could envisage the importance of stimuli being held in readiness for favorable feeding behavioral states. On the other hand, the very embodiment of the oral gustatory stimulation likely contributes to these premature newborns reach and remain at more favorable behavioral states for the feeding situation, contributing to the success of the offer of oral diet, and especially breastfeeding.

The fact of having been an increased suction specific behavior (SU), regardless of the taste stimulus received, points in the direction that the population of premature infants studied did not have the same ability to gustatory discrimination of healthy and term newborns researched by Medeiros[2].

Furthermore, when analyzing the water and sucrose groups separately also increased correlation of sucking behavior was observed in behavioral states light sleep (2) sleepy (3) in both groups. This increase of correlation seems to show that the intraoral stimulation contributes effectively so that there was sucking movements, which are also considered important for the feeding situation of the newborn.

The same was observed in the research[2] performed with newborn terms, in which stimulation, both in water and in sucrose group, triggered the action of the buccinator muscles, and consequently suction then swallowing. Importantly, this synchrony of movements associated with breathing is essential for effective breastfeeding.

However, it is noteworthy that in the sucrose group in behavioral alertness (4), the behavior of SU reached higher value than in the water group, this response may be from the suction effect of sucrose on the behavioral state considered more effective in the presence related behavior and readiness to breastfeeding[7-8]. The same may have occurred in the reduction of moderate to strong correlation in irritated/agitated (5) behavioral state, since this state is not considered favorable, unlike the behavioral state of alertness[29].

These data seem to indicate that sucrose in the specific behavior of suction provided soothing, as the effects of analgesic and calming obtained in non-pharmacological measurements in newborns undergoing painful procedures[7-16]. The use of sucrose, in turn, should also be discussed with more coverage in speech therapy field as a likely strategy for stimulating infants with feeding difficulties.

Sucrose was a stimulus capable of increasing the correlation of hand suction behaviors and sucking movements in alertness, which are considered ideal for the occurrence of readiness behavior to feeding[7,8]. Besides, in the specific behavior tongue protrusion independently from the RN have been stimulated with water or sucrose, gustatory stimulation favored the presence of the same, showing that the different taste stimuli used here in readiness for feeding contributed in this population.

In summary, we found in preterm infants, increased correlation for the specific behaviors related to the feeding system after oral stimulation, which envisions the possibility of gustatory stimulation be used to interfere with the activation of a feeding system.

CONCLUSION

In this study about population of premature infants, there was evidence of the existence of specific behaviors related to the feeding system, as demonstrated by Medeiros[2] in newborns terms and healthy. However newborns in this study did not show the same ability to discriminate taste of terms NBs, not corroborating the literature[7] which states that capacity been developed further at 32 gestational weeks.

However, it is noteworthy that both stimuli (water and sucrose) to encourage the behaviors of readiness to breastfeed in different behavioral states, and especially on the alert, they show that the use of gustatory stimuli in hospital routine preterm infants, could contribute to elicit behaviors of readiness to breastfeed collaborate in the activation of a feeding system, contributing to the baby can be fed orally earlier in life.

Thus, the main contribution of the present study was about the effect of gustatory stimuli evident in the age range studied (GAB average of 34,14 and 34,91 weeks of CGA) for specific behaviors of readiness to breastfeed, especially in behavioral alertness , pointing out that gustatory stimuli can be used in procedures to elicit behaviors of readiness to breastfeed in order to contribute to the nutrition of preterm infants and breastfeeding promotion at an early age.

Points up the need for further research that envisage effective conduits of gustatory stimulation, from speech therapy, allowing the activation of the feeding system, bringing benefits to newborns, especially in the situation of breastfeeding.

RESUMO

Objetivo: investigar a existência do sistema de alimentação em recém-nascidos prematuros a partir da estimulação gustativa. **Métodos:** estudo experimental, analítico, duplo-cego. Participaram 90 recém-nascidos prematuros, de uma maternidade pública de Sergipe. O teste foi filmado, constituindo-se por três momentos de cinco minutos. O primeiro e último momento sem realizar estímulo, o segundo momento com estimulação gustativa, sendo que os recém-nascidos foram divididos em dois grupos (água ou sacarose). Foram estudados os comportamentos específicos sucção de mão direita e esquerda, protrusão de língua e movimentos de sucção nos estados comportamentais sono profundo, sono leve, sonolento, agitado/irritado e choro. Para caracterizar a população foram utilizadas média, desvio-padrão e prevalências. Foi utilizado o teste não paramétrico Mann-Whitney para comparação de médias. O teste de Spearman verificou correlação entre estados comportamentais e comportamentos específicos em cada momento do teste. O valor de p foi significante quando menor que 0,05. **Resultados:** independente do estímulo administrado, a correlação aumentou em todos os comportamentos específicos. Comparando os grupos separadamente, após a estimulação, observou-se aumento de correlação em sucção de mão direita e protrusão de língua para ambos os grupos. O mesmo aconteceu em sucção, com exceção do estado agitado/irritado. Após a estimulação, houve maior correlação para o comportamento de sucção de mão esquerda no grupo sacarose quando comparado ao grupo água. Os resultados evidenciam que estímulos gustativos podem contribuir na prontidão para alimentação nesta população. **Conclusões:** evidenciou-se nos recém-nascidos prematuros aumento de correlação para os comportamentos específicos relacionados ao sistema de alimentação, após estimulação oral, o que vislumbra a possibilidade da estimulação gustativa ser utilizada para ativação de um sistema de alimentação em recém-nascidos prematuros.

DESCRITORES: Fonoaudiologia; Alimentação; Recém-Nascido; Prematuro; Sacarose

REFERENCES

1. Thoman EB. Changing views of the being and becoming of infant. In: Thoman EB (ed.), Origins of the infant's social responsivenes. Cap 17. Hillsdale, New Jersey U.S.A: Lawrense Erlbaum Associates, publishers, 1979.

2. Medeiros AMC. Contato das mãos com a região oral, protrusão de língua e movimentos de sucção em recém-nascidos humanos, a partir da estimulação oro gustativa [tese]. São Paulo: Instituto de Psicologia. NEC – Neurociências e Comportamento. Universidade de São Paulo; 2002.

3. Brazelton TB. Bebês e mamães. Tradução de Álvaro Cabral. Rio de Janeiro: Campus, 1981. P. 299.

4. Rochat P., Senders SJ. Active touch in infancy: action systems in development. In: Weiss MJS, Zelaro PR. Newborn attention: biological constraints and the influence of experience. NJ: Ablez Publishers, 1992. Cap 14, p. 412-42.

5. Medeiros, AMC. A existência de "Sistema Sensório-Motor Integrado" em Recém-nascidos humanos. Psicologia USP. 2007;18(2):11-33.

6. Douglas CR. Fisiologia da gustação. In: Douglas CR. Tratado de Fisiologia aplicada à ciência da saúde. 4. Ed. São Paulo: Robe, 1999. Cap 11, p. 197-204.

7. Brasil, Ministério da Saúde, Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Atenção humanizada ao recém-nascido de baixo peso: Método Canguru. 2ª. ed. Brasília, Ministério da Saúde, 2011. 203p.

8. Fernandes AM. The efficacy of kangaroo mother care, sucrose and pacifier to reduce responses of preterm infants to procedural pain (tese). Universidade de Lisboa/Escola Superior de Enfermagem de Lisboa. Lisboa, 2010.

9. Aquino, FM, Christoffel, MM. Dor neonatal: Medidas não-farmacológicas utilizadas pela equipe de enfermagem. Rev. Rene, vol. 11, Número Especial, 2010. p. 169-77.

10. Blasco, PG, Levites, MR, Mônaco, C. Açúcar reduz sinais de dor na vacinação de bebês. Diagn Tratamento. 2009;14(1):31.

11. Gaspardo CM, Linhares MBM, Martinez FE. A eficácia da sacarose no alívio de dor em neonatos: revisão sistemática da literatura. J. Pediatr. (Rio J.) 2005; 81(6).

12. Gaspardo CM, Miyase CI, Chimello JT, Martinez FE, Linhares MBM. Is pain relief equally efficacious and free of side effects with repeated doses of oral sucrose in preterm neonates? PAIN [online], 2008;137(1):16-25. ISSN 03043959.

13. Gibbins S, Stevens B, Hodnett E, Pinelli J, Ohlsson A, Darlington G. Efficacy and safety of sucrose for procedural pain relief in preterm and term neonates. Nur Res. 2002;51:375-82.

14. Gibbins S, Stevens B. The influence of gestational age on the efficacy and short-term safety of sucrose for procedural pain relief. Adv Neonatal Care. 2003;3:241-9.

15. Allen KD, White DD, Walburn JN. (1996). Sucrose as an Analgesic Agent for Infants During Immunization Injections. Archives of Pediatrics Adolescent Medicine, 1996;150: 270-4.

16. Acharya AB, Annamali S, Taub NA, Field D. (2004). Oral sucrose analgesia for preterm infant venepuncture. Archives of Disease in Childhood - Fetal and Neonatal Edition, 89, F17-F8.

17. Gorgulho FR, Pacheco STA. Amamentação de prematuros em uma unidade neonatal: a vivência materna. Esc Anna Nery Rev Enferm. 2008;12(1):19- 24.

18. Pedras CTPA, Pinto EALC, Mezzacappa MA. Uso do copo e da mamadeira e o aleitamento materno em recém-nascidos prematuros e a termo: uma revisão sistemática. Rev. Bras. Saude Mater. Infant. 2008;8(2):163-9.

19. Hernandez AM, Giordan CR, Shiguematsu RA. A intervenção fonoaudiológica em recém-nascidos de risco para distúrbios da deglutição e sua influência no aleitamento materno. Rev Bras Nutr Clin 2007;22(1):41-4.

20. Fujinaga CI, Scochi CGS, Santos CB, Zamberlan NE, Leite AM. Validação do conteúdo de um instrumento de avaliação de prontidão do prematuro para início da alimentação oral. Rev. Bras. Saúde Matern. Infant. 2008;8(4):391-9.

21. Marques MCS, Melo AM. Amamentação no alojamento conjunto. Revista CEFAC. 2008;10(2):261-71.

22. Medeiros AMC, Olivieira ARM, Fernandes AM, Guardachoni GAS, Aquino JPSP, Rubinick ML et al. Caracterização da técnica de transição da alimentação por sonda enteral para seio materno em recém-nascidos prematuros. J. Soc. Bras. Fonoaudiol. [online]. 2011;23(1):57-65. ISSN 2179-6491. http://dx.doi.org/10.1590/S2179-64912011000100013.

23. Medeiros AMC, Bernardi AT. Alimentação do recém-nascido prematuro: aleitamento materno, copo e mamadeira. Rev. Soc. Bras. Fonoaudiol. 2011;16(1):73-9.

24. Rocha MS, Delgado SE. Intervenção fonoaudiológica em recém-nascido pré-termo com Gastrosquise. Rev Soc Bras Fonoaudiol. 2007;12(1):55-62.

25. Zomignani AP, Zambelli HJL, Antonio MARGM. Desenvolvimento cerebral em recém-nascidos prematuros. Rev. Paul. Pediatr. 2009;27(2):198-203.

26. Ferreira AM, Bergamasco NHP. Análise comportamental de recém-nascidos pré-termos incluídos em um programa de estimulação tátil-cinestésica durante a internação hospitalar. Rev Bras Fisioter. 2010;14(2):141-8.
27. Telles MS, Macedo CS. Relação entre desenvolvimento motor corporal e aquisição de habilidades orais. Rev. Pró-Fono. 2008;20(2):117-22.
28. Moura LTL, Tolentino GM, Costa TLS, Aline A. Atuação Fonoaudiológica na estimulação precoce da sucção Não-Nutritiva em Recém-Nascidos Prematuro. Revista CEFAC. 2009;11(Supl3):448-56.
29. Csillag S. Os três primeiros dias de vida: uma observação dos estados comportamentais do bebê recém-nascido [tese]. São Paulo: Instituto de Psicologia. Universidade de São Paulo, 1997.
30. Dancey, CP, Reidy, J. Estatística sem matemática: usando SPSS para Windows. 3 ed. Porto Alegre: Artmed. 2006.
31. Yamamoto RCC, Bauer MA, Häeffner LSB, Weinmann ARM, Keske-Soares M. Os efeitos da estimulação sensório motora oral na sucção nutritiva na mamadeira de recém-nascidos pré-termo. Rev CEFAC. 2010;12(2):272-9.
32. Medeiros, AMC. A existência de "Sistema Sensório-Motor Integrado" em Recém-nascidos humanos. Psicologia USP. 2007;18(2):11-33.
33. Andrade ISN, Guedes ZCF. Sucção do recém-nascido prematuro: comparação do método Mãe-Canguru com os cuidados tradicionais. Revista Brasileira de Saúde Materno Infantil, Recife, 2005;5(1):61-9.

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Mailing address:
Andréa Monteiro Correia Medeiros
Universidade Federal de Sergipe - Núcleo de Fonoaudiologia
Rua Marechal Rondon s/n, Cidade Universitária Prof. José Aloísio de Campos, Jardim Rosa Elze
São Cristovão – SE – Brasil
CEP: 49100-000
E-mail: andreamcmedeiros@ig.com.br