Nutritive sucking pattern—From very low birth weight preterm to term newborn

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ABSTRACT

The contribution of maturation and stimulation to the development of oral feeding was investigated, with two main objectives: (1) to analyze the nutritive sucking pattern of very-low-birth-weight newborns from their first oral feeding to the acquisition of independent oral feeding, and (2) to compare the nutritive sucking patterns of these babies, after feeding autonomy, with healthy term newborns.

Methods: Two groups were considered for analysis. Group 1: N=15 Very-Low-Birth-Weight (VLBW), gestational age (GA)=28.15±1.5, birth weight (BW)=1178.3±174.4. The intervention program began at 30.19±1.52 weeks GA. Group 2: N=25 term newborns, healthy, GA=39.04±1.2, BW=3370.42±310.76. Repeated measures of the following variables were taken (weekly for group 1): suction efficacy (SEF), rhythm of milk transfer (RMT), sucks, bursts and pauses. Group 2 was analysed only once between the 2nd and 5th day of life.

Results: Group 1 has revealed a minimal suction number at 32 GA weeks (82±77.6) and maximal suction number at 36–37 GA weeks (162.7±60.7). The number of sucks seemed to be dependent of weight (p=0.005), duration of intervention (p=0.001) and chronological age (p=0.000). Significant statistical effects of gestational age were not observed (p=0.904). Sucks in bursts represented 77% at the beginning of oral feeding (32 weeks GA), and 96% at 33 weeks GA, remaining constant thereafter. The number of sucks and bursts increased with GA and weeks of feeding. The mean duration of the pauses decreased from first to fourth week of feeding (week1=14.1±9.1 and week4=6.4±1.4 s). The sucking efficacy (SEF) was better explained by weight (p=0.000), number of sucks in 5 min (p=0.025) and chronological age (p=0.044). Gestational age (p=0.051) and nutritive intervention duration (NDI) (p=0.110) did not contribute to explain SEF. Despite the observation of significant statistical differences between groups regarding GA (35.9/39.08; p=0.00), chronological age (53.3/2.5; p=0.000), the nutritive suction pattern was not statistically different between groups after feeding autonomy.

Conclusion: in VLBW oral feeding before 32 weeks GA allows the attainment of a mature nutritive suction pattern before term (37–40 weeks). Experience seems to be one of the influencing factors in the change of the nutritive suction pattern.

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1. Introduction

Hospital discharge of very-low-birth-weight (VLBW) babies depends frequently on their feeding autonomy [1,2]. The success in oral feeding depends on the adequate coordination of sucking, swallowing and breathing [3,4] and also on the behavioural states of the newborn [5,6]. Oral feeding is commonly initiated at 34 weeks of corrected age [7–9].

In the healthy term newborn, after birth, the coordination between rhythms of sucking, swallowing, and breathing, is optimized only following the first 48 h of life, and the qualitative alterations in the sucking pattern may be derived from sensorial feedback and from learning and feeding experience [4,10–12].

It has been debated whether maturation of the sucking–swallowing–breathing coordination is related with postconceptional age (maturation’s perspective) or with experience (behaviourist perspective) [13]. Experience and practice enhance oral motor capacities and sucking–swallowing–breathing coordination [13,14]. Maturation of the suction and swallowing pattern seems to follow a caudalocentric process, since the stabilization of the swallowing rhythm precedes the stabilization of the sucking rhythm [15,16]. At 28 weeks of postconceptional age sucking and swallowing are sufficiently coordinated to allow oral feeding. Swallowing movements can be first observed in uterus around 10–14 weeks of pregnancy [17]. However, at 28 weeks of gestation, coordination of swallowing and breathing is not well developed making oral feeding difficult and dangerous.
With age, preterm babies resort more frequently to the sucking component and they improve their capacity, efficiency and total amount of milk sucked. This seems to result from different factors: maturation, practice, coordination, increase in strength, decrease in fatigue, or from a combination of some of these factors [18–20].

The present study has the following objectives: 1) to evaluate the evolution of the sucking pattern in newborns with less than 32 weeks of gestational age (GA) and a birth weight (BW) less than 1500 g, submitted to a program of non nutritional and nutritional oral intervention, from the beginning of oral feeding up to autonomous oral feeding; 2) to compare the sucking pattern in this Group, after attaining oral feeding autonomy, with a Group of term newborns, relative to: sucking efficacy, rhythm of milk transfer and nutritive sucking pattern.

2. Methods

This study followed a repeated measurements design, in a Neonatal Intensive Care Unit (NICU) of a Level III Portuguese Hospital. For Group 1, a non-randomized convenience sample was selected, and submitted to an intervention program. This intervention includes non-nutritive (NNOI) and nutritive oral stimulation (NOI), kangaroo care, and massage therapy [21]. This Group included 15 newborns, 4 girls and 11 boys. Birth weight ranged between 500 g and 1499 g and gestational age was less than 32 weeks. These newborns were submitted, up to week 32, to the global intervention program [21]. Repeated observations took place every week throughout the treatment, with a maximum duration of six weeks.

Group 2 included 25 healthy term newborns, 15 girls and 10 boys (37 to 41 weeks GA). A non-randomized convenience sample was selected for this Group, in which no treatment was applied. These newborns were observed in a single moment, between the 2nd and 5th day of life (2.5+/−0.66 days) (Table 1), so that optimal sucking capacity was observed [10]. The descriptive characteristics of Groups 1 and 2 are presented in Table 1.

The following exclusion criteria were considered: a) newborns that initiated the intervention program after 32 weeks; b) IUGR (BW inferior to percentile 10 for GA); c) newborns that have interrupted the intervention program for more than a week (ex. Level II necrotizing enterocolitis or greater); d) neonatal asphyxia (Apgar score <5 at 5 min of life); e) intraventricular haemorrhage level 3 or 4 of the Papille classification [22]; f) central nervous system disorders; g) chromosomal disease; h) polymeric systemic syndromes; i) broncho-pulmonary dysplasia defined as oxygen dependence at 36 weeks.

The sucking rhythm pattern was analysed in its time frame by means of video. It may be evaluated by direct observation methods, which are also the least intrusive [10,23,24]. Observation of the mandible movements has a direct correspondence with the expression/compression component [10] and a good correlation with the electromyography method [23].

The other variables involved the measurement of quantities of milk, regarding sucking efficacy, rhythm of milk transfer and nutritive sucking pattern. For the present study the following variables were defined:

i. Quantity of milk ingested in the first 5 min of feeding. Defined as sucking efficacy (SEF), and expressed in mL;
ii. Quantity of milk ingested per minute, obtained by the proportion between the quantity of milk ingested and the elapsed time in minutes. Defined as milk ingestion velocity (MIV), calculated by SEF/time, and expressed in mL of milk/minute;
iii. Number of sucks in the first 5 min of feeding (S/5 min).

Sucking was defined as simultaneous visible contraction movements of the lips and facial muscles;
iv. Average amount of milk ingested per suction, and designated by rhythm of milk transfer (RMT). Calculated by the ratio between the total amount of milk ingested and the total number of suctions and expressed in mL of milk per suction.
v. Total number of bursts per feeding episode (Bursts). A burst was defined as 2 or more sucks within a 2 second interval;
vi. Proportion of sucks in bursts (S/Bursts). Obtained through the division of the total number of sucks in bursts by the total number of sucks per feeding episode;

Mean of sucks in burst (mBursts). Calculated by dividing the Sc/Bursts by the total number of bursts;

vii. Total number of pauses per feeding episode (Pauses). Pause was defined as the time interval equal or superior to 2 s, without any sucking activity movement;
ix. Proportion between the total time of pause and the duration of feeding (tPause). It was calculated by dividing the total time in pauses by the total feeding time;
x. Mean duration of Pauses, in seconds (mPauses);
x. Age of beginning oral feeding (AO), in weeks of GA;
xii. Age of initiation of feeding autonomy (FA), in GA weeks, and defined as the capacity of sucking the total amount of milk prescribed, in all feeding episodes, for a period of 24 h;
xiii. The nutritive duration of intervention in weeks, since the beginning of NOI up to the acquisition of oral feeding autonomy (NDI);
xiv. Weight in grams (W);
xv. Chronological age in days (CA), day 1 being the day of birth.

The following variables were also considered: the daily prescribed amount of milk (mL/Kg/day), the amount of milk prescribed in each feeding, the amount of milk administrated from a bottle, and the amount of milk prescribed through a probe. The weight of the child was used to calculate the amount of milk prescribed.

The initiation of NOI and NNOI were registered for Group 1 subjects, as well as the start of oral feeding, feeding autonomy and hospital discharge. The elapsed time from the beginning of NOI until the acquisition of oral feeding autonomy (NDI) was also calculated.

During a normal feeding period the newborns sucking behavior was videoed once a week. The same expert fed all the babies, using adequate nipple bottles, and she was instructed to avoid variations in the posture and feeding technique.

Babies were in a behavioural state of awareness (stage 4 of Brazelton) [25] when they begun the feeding. A wide angle profile of the face was used to film the baby’s face, so as to capture the mouth, lips, and facial muscle movements. The initial 5 min of the feeding episode was filmed [19], during which the baby maintained sucking (corresponding to 25% of the total time of feeding calculated in 20 min). For the babies that sucked the total amount of milk in less than 5 min, the duration of the complete feeding episode was used for the calculation of some variables, and SEF value equals the amount of prescribed milk.

Table 1

Descriptive characteristics of the sample

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Gestational age, weeks</td>
<td>28.15 (1.52)</td>
<td>39.08 (1.18)</td>
</tr>
<tr>
<td>Birth weight, grams</td>
<td>1178.30 (174.39)</td>
<td>3360.00 (308.70)</td>
</tr>
<tr>
<td>Gender, F/M</td>
<td>4/11</td>
<td>15/10</td>
</tr>
<tr>
<td>Apгар score 1st min</td>
<td>7.6 (3–9)</td>
<td>8.9 (8–10)</td>
</tr>
<tr>
<td>Apгар score 5th min</td>
<td>9.7 (9–10)</td>
<td>9.4 (9–10)</td>
</tr>
<tr>
<td>CRIB</td>
<td>1.3 (0–3) –</td>
<td>–</td>
</tr>
<tr>
<td>NTISS</td>
<td>14.2 (7–18) –</td>
<td>–</td>
</tr>
<tr>
<td>Ventilation time, days</td>
<td>1.46 (0–7) –</td>
<td>–</td>
</tr>
<tr>
<td>Prenatal steroids, %</td>
<td>0.73 –</td>
<td>–</td>
</tr>
<tr>
<td>Beginning of stimulation (Gestational age, weeks)</td>
<td>30.19 (1.52) –</td>
<td>–</td>
</tr>
</tbody>
</table>

Mean values and standard deviation; except for Apгар score, CRIB—Clinical Risk Index for Babies, NTISS—Neonatal Therapeutic Intervention Scoring System and ventilation time (minimal and maximal value); prenatal steroids percentage and gender distribution; F—female, M—male.
The term newborns (Group 2) were filmed during a baby bottle feeding episode between 48 h and 120 h of life. The newborns were filmed in the nursery, near the mothers, but the administration of milk was performed by the same expert that fed the babies in Group 1. All filming procedures were identical to those considered for Group 1. The amount of milk ingested in the first 5 min of the feeding was registered according to the definition used by Lau et al. [19].

The videos were analysed, and the counting of sucks was done by pressing a sensor connected to an A/D Biopac converter, with posterior processing in AcqKnowledge Software, version 3.8.1, with a sampling frequency of 100 Hz. Sucks were defined by simultaneous movement of the lips and contraction of facial muscles. The registration of sucks over time is represented in Fig. 1. The calculations of all variables involving time were based upon this registration.

Statistical analysis was performed using the SPSS 13.0 (Statistical Package for the Social Sciences, Inc., USA), and a significance level of \( \alpha = 5\% \) was adopted.

Statistical analysis was oriented towards three main aspects: (1) the variation of variables that reflect the nutritive sucking pattern, such as Rhythm of Milk Transfer (RMT), Sucking Efficacy (SEF) and milk ingestion velocity (MIV), in different gestational ages, (2) the

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Table 2
Descriptive characteristics of the studied variables according to gestational age in group 1—mean values and standard deviation

<table>
<thead>
<tr>
<th></th>
<th>32 wGA</th>
<th>33 wGA</th>
<th>34 wGA</th>
<th>35 wGA</th>
<th>36 wGA</th>
</tr>
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<tbody>
<tr>
<td>N</td>
<td>7</td>
<td>12</td>
<td>12</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>Weight</td>
<td>1386.20</td>
<td>1512.20</td>
<td>1543.90</td>
<td>1713.70</td>
<td>1753.20</td>
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<tr>
<td>CA</td>
<td>(202.20)</td>
<td>(253.80)</td>
<td>(236.50)</td>
<td>(285.70)</td>
<td>(208.10)</td>
</tr>
<tr>
<td>Sucks/5 min</td>
<td>82.40</td>
<td>110.83</td>
<td>112.80</td>
<td>153.60</td>
<td>162.70</td>
</tr>
<tr>
<td>Bursts</td>
<td>10.50</td>
<td>18.10</td>
<td>15.20</td>
<td>14.90</td>
<td>13.00</td>
</tr>
<tr>
<td>Suc/Burst %</td>
<td>77</td>
<td>96</td>
<td>89</td>
<td>92</td>
<td>97</td>
</tr>
<tr>
<td>mBurst</td>
<td>6.20</td>
<td>6.70</td>
<td>7.90</td>
<td>11.30</td>
<td>15.40</td>
</tr>
<tr>
<td>tPause %</td>
<td>74</td>
<td>64</td>
<td>66</td>
<td>48</td>
<td>37</td>
</tr>
<tr>
<td>mPause</td>
<td>14.03</td>
<td>19.70</td>
<td>8.90</td>
<td>7.30</td>
<td>7.10</td>
</tr>
<tr>
<td>SEF</td>
<td>5.20</td>
<td>11.30</td>
<td>8.80</td>
<td>16.90</td>
<td>24.70</td>
</tr>
<tr>
<td>MIV</td>
<td>1.10</td>
<td>2.42</td>
<td>1.77</td>
<td>3.90</td>
<td>6.40</td>
</tr>
<tr>
<td>RMT</td>
<td>0.10</td>
<td>0.11</td>
<td>0.09</td>
<td>0.13</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.11)</td>
<td>(0.08)</td>
<td>(0.11)</td>
<td>(0.10)</td>
</tr>
</tbody>
</table>

wGA: gestational age in weeks; CA: chronological age in days; Sucks/5 min: number of sucks in the first 5 min of feeding; Suc/Burst %: proportion of sucks in burst; mBurst: mean of sucks per burst; tPause %: percentage of the feeding in pause; mPause: mean duration of pause; SEF: sucking efficacy; MIV: milk ingestion velocity; RMT: rhythm of milk transfer.

Table 3
Descriptive characteristics of the studied variables according to feeding week (1st to 5th week) in group 1—mean values and standard deviation

<table>
<thead>
<tr>
<th></th>
<th>1st w</th>
<th>2nd w</th>
<th>3rd w</th>
<th>4th w</th>
<th>5th w</th>
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<tr>
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<td>15</td>
<td>15</td>
<td>14</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Weight</td>
<td>1339.00</td>
<td>1517.00</td>
<td>1677.00</td>
<td>1833.00</td>
<td>1853.00</td>
</tr>
<tr>
<td>GA</td>
<td>32.90</td>
<td>34.00</td>
<td>35.70</td>
<td>35.60</td>
<td>36.30</td>
</tr>
<tr>
<td>CA</td>
<td>(1.18)</td>
<td>(1.20)</td>
<td>(1.20)</td>
<td>(0.90)</td>
<td>(0.77)</td>
</tr>
<tr>
<td>Sucks/5 min</td>
<td>68.10</td>
<td>130.60</td>
<td>137.70</td>
<td>153.60</td>
<td>172.60</td>
</tr>
<tr>
<td>Bursts</td>
<td>11.60</td>
<td>16.80</td>
<td>14.00</td>
<td>15.00</td>
<td>17.40</td>
</tr>
<tr>
<td>Suc/Burst %</td>
<td>80</td>
<td>90</td>
<td>97</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>mBurst</td>
<td>4.90</td>
<td>8.20</td>
<td>12.90</td>
<td>10.50</td>
<td>12.80</td>
</tr>
<tr>
<td>tPause %</td>
<td>79</td>
<td>59</td>
<td>50</td>
<td>45</td>
<td>45</td>
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<tr>
<td>mPause</td>
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<td>22.00</td>
<td>15.70</td>
<td>19.00</td>
<td>19.20</td>
</tr>
<tr>
<td>SEF</td>
<td>4.40</td>
<td>7.40</td>
<td>6.50</td>
<td>6.50</td>
<td>8.30</td>
</tr>
<tr>
<td>MIV</td>
<td>(18)</td>
<td>(19)</td>
<td>(21)</td>
<td>(20)</td>
<td>(22)</td>
</tr>
<tr>
<td>RMT</td>
<td>14.10</td>
<td>8.20</td>
<td>8.90</td>
<td>6.40</td>
<td>7.00</td>
</tr>
<tr>
<td></td>
<td>(9.10)</td>
<td>(2.90)</td>
<td>(3.10)</td>
<td>(1.40)</td>
<td>(1.60)</td>
</tr>
<tr>
<td>SEF</td>
<td>4.40</td>
<td>7.40</td>
<td>6.50</td>
<td>6.50</td>
<td>8.30</td>
</tr>
<tr>
<td>MIV</td>
<td>0.90</td>
<td>1.69</td>
<td>4.70</td>
<td>5.60</td>
<td>5.20</td>
</tr>
<tr>
<td>RMT</td>
<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>(0.05)</td>
<td>(0.05)</td>
<td>(0.12)</td>
<td>(0.11)</td>
<td>(0.05)</td>
</tr>
</tbody>
</table>

GA: gestational age in weeks; CA: chronological age in days; Sucks/5 min: number of sucks in the first 5 min of feeding; Suc/Burst %: proportion of sucks in burst; mBurst: mean of sucks per burst; tPause %: percentage of the feeding in pause; mPause: mean duration of pause; SEF: sucking efficacy; MIV: milk ingestion velocity; RMT: rhythm of milk transfer.

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![Fig. 1.](https://example.com/fig1.png) The count of sucks between the 1st and last week in case 2 of Group 1. The x-axis gives time from zero to 300 s. The y-axis represents the development of sucking episodes from week 31 to week 35. The spikes are the sucks, the interval between sucks, equal or superior to 2 s corresponds to pauses; 2 or more spikes with interval less than 2 s between them correspond to bursts.

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![Diagram](https://example.com/diagram.png)
comparison between Groups in respect to oral feeding autonomy and nutritive sucking pattern, and (3) the correlations between variables. T-tests (Paired Samples t test—P-S t test and Independent Samples t test—I-S t test), Wilcoxon Signed Ranks (W-S-R test) and Mann–Whitney–U test (M–W–U test) were used for comparisons, and linear regression and Pearson bi varied correlation test were adopted to analyze correlations between variables.

Informed consent from the parents was obtained and the study was approved by the Hospitals Ethics Committee.

3. Results

A minimum amount of suctions in 5 min was observed at 32 weeks (82.40±77.60) and a maximum value at 36 weeks (162.7±60.7). The number of suctions increased with gestational age. Statistically significant differences were detected between 32/34 weeks (p=0.002; P-S t test), 32/35 weeks (p=0.010; P-S t test), 33/36 weeks (p=0.025; P-S t test), and 34/35 weeks (p=0.037; P-S t test) (see Table 2).

As expected, a gradual increase in the number of suctions (Sc/5 min) per week of feeding was also observed, the first week being clearly different from other subsequent moments (see Table 3). Comparisons between the Sc/5 min in the first and subsequent weeks were all statistically significant (p<0.01; P-S t test). The values of Sc/5 min observed in the second week were also significantly different from those observed at the fifth week (p=0.045; P-S t test).

A multiple linear regression model, with the variables Weight (W), nutritive duration of intervention (NDI), chronological age (CA), and gestational age (GA) as predictors, could account for 41.1% of the total nutritive duration of intervention (NDI), chronological age (CA), and third week of oral feeding (see Table 3). In both variables there were statistically significant differences between 32 weeks to 37% at 36 weeks of gestational age (see Table 2). This difference was statistically significant in this model (p=0.004).

The number of bursts increased with gestational age from 32 to 33 weeks of gestational age, keeping a constant from there on (see Table 2). This difference was statistically significant between 32/35w (p=0.028; P-S t test).

The number of suctions in bursts increased dramatically with gestational age, varying from a minimum of 2 to a maximum of 103 at 36 week. At 32nd week of gestational age the mean percentage of suctions increased with gestational age. Statistically significant differences were observed between 32/34 weeks (p=0.016; W-S-R test), 33/35 weeks (p=0.016; P-S t test), 34/36 week (p=0.028; W-S-R test), 33/35 week (p=0.046; P-S t test), 34/35 week (p=0.016; P-S t test) and 34/36 week (p=0.045; P-S t test).

A multiple linear regression model explained 49% of the proportional time spent in pause. The best predictors were chronological age.
The proportion of sucks in bursts seems to follow two or three stages. It was less than 80% at 32 weeks GA, it was around 90% until 35 weeks GA, and higher than 95% after 35 weeks GA. These results are in accordance to those referred by Gewolb et al. [16], indicating that the development of sucking activity follows a predictable maturation pattern. At 32–33 weeks GA a fast pattern of low amplitude sucking was observed, with a frequency of 2–3 Hz, not necessarily rhythmic or coordinated with swallowing. After 33 weeks GA sucking decreases to approximately 1 Hz, stabilizing and matching the swallowing activity, and establishing a sucking–swallowing dyad [3,15]. Organization of the sucks in bursts would be the next step [15], and a little different than those found by Medoff-Cooper et al. [26], in which the only difference found was between 36/37 weeks GA and the term age 38/42 weeks GA. Maturation and experience seem to interact in the development of the sucking pattern [15,26].

The duration of intervention, chronological age and weight influenced significantly the number of sucks. The proportion of sucks in bursts seems to follow two or three stages. It was less than 80% at 32 weeks GA, it was around 90–95% until 35 weeks GA, and higher than 95% after 35 weeks GA. These results are in accordance to those referred by Gewolb et al. [16], indicating that the development of sucking activity follows a predictable maturation pattern. At 32–33 weeks GA a fast pattern of low amplitude sucking was observed, with a frequency of 2–3 Hz, not necessarily rhythmic or coordinated with swallowing. After 33 weeks GA sucking decreases to approximately 1 Hz, stabilizing and matching the swallowing activity, and establishing a sucking–swallowing dyad [3,15]. Organization of the sucks in bursts would be the next step [15], and a little different than those found by Medoff-Cooper et al. [26], in which the only difference found was between 36/37 weeks GA and the term age 38/42 weeks GA. Maturation and experience seem to interact in the development of the sucking pattern [15,26].

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The existence of a positive correlation between the SEF and the weight, CA, NDI and the number of sucks in 5 min, in Group 1, seems to indicate the influence of experience (CA and NDI) and muscular strength (weight) in the quantity of sucked milk. These influences were also demonstrated by other authors [8,11,18]. The comparison between Groups regarding feeding autonomy, and despite the significant differences in gestational age (35.90/39.08) and weight (1875/3360 gr), showed no differences in the variables used to describe the sucking competence. This may be the result of the experience attained by Group 1, since we found a significant difference in the chronological age when comparing both Groups (53.5/2.5 days). These results are in accordance with the observations by different authors [11,18,24,26].

Another important factor in the change of pattern seems to be muscular strength, which increases with weight gain, as was demonstrated for the number of sucks, the frequency of sucks and burst duration in the non-nutritive sucking (NNS) [31–33]. We have observed a positive and statistically significant correlation between the sucking efficacy, weight gain and chronological age, but no statistical effect of gestational age, when evaluated by multiple linear regressions.

The stimulation of NNS seems to favour the self-organization of the preterm newborn [34] allowing a better weight gain and nutritive sucking capacity improvement [6,35]. However, Pickler and Reyna [34] reported recently a case of no effect of NNS in NS, which was associated with newborn’s short time stimulation. Mizuno and Ueda [29] also concluded that there was no interference of non-nutritive sucking (NNS) in the nutritive sucking (NS) pattern acquisition in term newborns. The relationship between these sucking patterns is, at least, controversial [37,38].

The research about the effects of stimulation upon nutritive sucking is promising. Some authors have demonstrated that early and repeated teaching can facilitate the development of nutritive sucking [11,14,18,39]. Among other possible explanations, it is plausible that stimulation accelerates the maturation and coordination of the muscles (tongue and mandible) used in expression [18]. The improvement of sucking pattern coordination can be obtained through the maintenance of a stimulus of the oral and peri-oral peripheral mechanoreceptors that mimics the natural movement [40].

Our results indicated that there are other factors, besides maturation, that influence the sucking pattern. The increase in sucking efficacy seems to depend mainly upon muscular strength, highly correlated with bodyweight. Sucking efficacy was directly influenced by burst duration and percentage of sucks in burst, as well as by the decrease in the mean duration of pauses and the percentage of feeding episode at pause. Experience, expressed by chronological age and duration of intervention, also plays a role in the process of development of nutritive sucking. Finally, gestational age, that is a direct indicator of maturation, is a relevant variable in the whole process.

These results also suggest that VLBW born before 32 weeks GA, without neurological or breathing problems, when submitted to a non-nutritive sucking, is a relevant variable in the whole process of nutritive sucking. Finally, gestational age, that is a direct indicator of maturation, is a relevant variable in the whole process.

References