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# Orofacial Myofunctional Aspects of Nursing Infants and Preschoolers

Andréa Monteiro Correia Medeiros[1] Herick Santos Assis[1] Maria Vanessa Martins Alves[1] Yasmin Fernandes Silva Santana[1] William José e Silva-Filho[2] Íkaro Daniel de Carvalho Barreto[3] Giédre Berretin-Felix[4]

[1] Departamento de Fonoaudiologia, Universidade Federal de Sergipe, São Cristóvão, SE, Brasil
[2] Departamento de Odontologia, Universidade Federal de Sergipe, São Cristóvão, SE, Brasil
[3] Departamento de Informática e Estatística, Universidade Federal Rural de Pernambuco, Recife, PE, Brasil
[4] Departamento de Fonoaudiologia, Universidade de São Paulo, Bauru, Brasil

**Address for correspondence** Ikaro Daniel de Carvalho Barreto, PhD, Programa de Pós-Graduação em Biometria e Estatística Aplicada, Universidade Federal Rural de Pernambuco, Rua Dom Manuel de Medeiros, S/N, CEP: 52171-900, Dois Irmãos, Recife, PE, Brazil (e-mail: daniel.carvalho.ib@gmail.com.br).

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## Abstract

**Introduction** Clinical assessment in orofacial motricity is required for the speech therapist to diagnose and treat disorders involving the stomatognathic system. Validated tools can help establish a prognosis and outline intervention methods connected to human development.

**Objective** The goal of the present study was to examine the domains of the oromyofunctional assessment of nursing infants and preschoolers according to sex and age group, as well as the application of the MMBGR Protocol – Nursing Infants and Preschool Children.

**Methods** A quantitative technique was used to conduct an analytical and cross-sectional investigation. The present study included a total of 214 healthy breastfeeding infants and preschoolers of both sexes. The Mann-Whitney test was used to compare the medians. The Spearman correlation of each test domain was determined. R Core Team 2021 (R Foundation, Vienna, Austria) was used, and the significance threshold was set at 5%.

**Results** In intraoral and extraoral examinations, there was a difference between sexes for tongue scores in nursing infants ($d = -0.428$; $p = 0.045$), worse in males. When the orofacial functions were considered in nursing infants, there were differences between the sexes for the liquid/solid/semisolid deglutition scores ($d = 0.479$; $p = 0.031$), with females performing worse. There were sex differences in solid/semisolid deglutition ($d = -0.335$; $p = 0.043$), and speech in preschoolers ($d = -0.478$; $p = 0.034$), including the production of phones/phonemes ($d = -0.599$; $p = 0.007$), which were always worse in males.

**Conclusion** The research revealed sex disparities and related the domains of oromyofunctional assessment, according to scores, of the domains of myofunctional assessment, as recorded in a standardized oromyofunctional assessment protocol by age group.

**Keywords**

- ► nursing infant
- ► preschoolers
- ► stomatognathic system
- ► speech
- ► language and hearing sciences
- ► evaluation studies as topic

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## Introduction

Clinical assessment in orofacial motricity (OM) is required for the speech therapist to diagnose and treat disorders involving the stomatognathic system,[1] which is composed of structures such as bones, teeth, muscles, tongue, lips, and cheeks that are joined and articulated with the help of the mandible and controlled by the central nervous system.[2,3]

The tongue, as a structure of the stomatognathic system, is essential to all orofacial functions. It has a lingual frenulum on the bottom that permits it to attach to the floor of the mouth. Changes in the frenulum can affect sucking ability from birth, as well as swallowing, chewing, and speaking abilities later in life.[4,5]

The morphofunctional balance is configured by the stomatognathic system, which works with the interplay between shape and function.[2] Each orofacial function is related with the phonoarticulatory organs in this dynamic, completing their individual motor and neuromuscular functions and playing a critical role in the harmonic maintenance of the craniofacial complex.

Deglutition is a complicated and dynamic mechanism controlled by the cortex, trunk, and brain nerves that incorporates both respiratory muscles and the gastrointestinal tract. The study of the voluntary oral preparatory phase, which encompasses mastication, incision, crushing, and spraying activities, as well as nasal breathing, stands out in OM.[6]

Deglutition can be altered as people get older,[7] depending on their growth and development. In general, symptoms of chewing develop in the infant at 6 months of age, coinciding with the emergence of teeth. Around the age of two, the chewing pattern with rotational motions of the mandible and lingual lateralization begins. There is a progression to a more mature deglutition pattern with neuropsychomotor development.[8]

Changes in deglutition and mastication functions are linked to speech patterns, which are also linked to the development of orofacial articulatory movements. Speech production involves linguistic, cognitive, and sensorimotor processes, with the muscular system playing a key role in the creation of phonemes through a series of voluntary motor movements.[9]

The standardized research of anatomical and functional characteristics of the orofacial region gives scientific evidence that is less prone to errors.[10] Validated tools can help establish a prognosis and outline intervention methods connected to human development by qualifying the conducted assessments.[11] Early oromyofunctional assessment can be done using the MMBGR Protocol – Nursing Infants and Preschoolers.[12]

The goal of the present study was to examine, evaluate, and relate the domains of the orofacial myofunctional clinical examination of nursing infants and preschoolers, based on scores, sex, and age group under null hypothesis of equality of scores in all domains of the orofacial myofunctional clinical examination between sexes in each age group with the application of the MMBGR Protocol – Nursing Infants and Preschoolers.[12]

## Methods

Analytical and cross-sectional study with a quantitative approach, approved by the Research Ethics Committee (REC) of Universidade Federal de Sergipe, under the approval number 12529419.6.0000.5546.

The study included 214 nursing infants and preschoolers of both sexes who attended public daycare centers in the states of Sergipe and São Paulo, as well as the University Hospital (HU, in the Portuguese acronym) of Universidade Federal de Sergipe outpatient clinic in Aracaju who were submitted to orofacial myofunctional evaluation, with respective registration in the Nursing Infants and Preschoolers in the MMBGR Orofacial Clinical Myofunctional Examination Protocol.[12]

Participants must be between 6 months and 5 years and 11 months old, be healthy, and have no neurological involvement as inclusion criteria. The researchers used the Health Area Descriptors (DECs), which classify nursing infants from 1 to 23 months old and preschoolers from 2 to 5 years old as nursing infants.[13]

As exclusion criteria, we considered those who did not complete the clinical examination in full, and/or who had images of unsatisfactory or noncompatible quality for analysis, making it impossible to fully apply the instrument used in the present research.

The MMBGR – Nursing Infants and Preschoolers protocol consists of the Orofacial Myofunctional Examination, which contains items scored (in score), scaled by age group assessed, with values ranging from zero (best possible value to be obtained) to, respectively, 114 (6–11 months), 160 (12–23 months), 135 (24–35 months) and 150 (36–71 months), for total scores.[12]

The researcher was responsible for the direct assessment of all participants. Clinical examination of the phonoarticulatory organs (OFAs, in the Portuguese acronym) and the functions of the stomatognathic system was performed individually, considering the aspects related to the age group of the studied population. Registration procedures have been standardized.

Each subject was filmed throughout the clinical examination, totaling $\sim$ 30 minutes throughout the procedure. Dynamic and static images were captured using a digital camera (Panasonic Compact-VHS Palmcorder [Panasonic, Osaka, Japan]) positioned in front of the subject, to obtain the closest image of the orofacial region (Macro Led Ring Flash HD lens was used).

The captured images (static and videos), referring to the evaluation of the OM of the research participants, were edited and stored directly in the drive, and shared for filling out the MMBGR protocol of each subject by the evaluator speech therapists. Seven speech therapists with knowledge in the OM area participated. One of the evaluators was the researcher (Evaluator 1), considered an expert in the area, who analyzed all the cases in the research; and the other 6 evaluators (called Evaluators 2, 3, 4, 5, 6, and 7) were distributed by age groups, constituting the second evaluator of the clinical case.

The calibration procedure was performed between the evaluators, and a document containing guidelines was jointly elaborated to guide the analysis of each aspect to be observed by age group.

 

This document contained all the items of the protocol to be applied with the insertion of a static (photos) and dynamic (videos) image[14] of an infant and a preschooler on each aspect to be analyzed, serving as an instruction for the application of the protocol. Rater calibration procedures were based on this document. The first stage of the calibration procedure was performed openly, with the discussion of a common report case, and, after having settled all the doubts between the evaluators, each one of them performed an individual analysis of another clinical case separately.

In a second stage of the calibration procedure, each pair of evaluators applied the adapted protocol to the same subject but without communicating with each other, and it was expected that an agreement between raters > 70% would be obtained for the whole protocol. When 70% agreement between raters was achieved, raters were allowed to apply to another subject. When the 70% agreement between raters was not achieved, the disagreements were discussed, and the raters restarted the second stage of the calibration procedure.

This 70% case agreement between raters must be reached in at least 5 consecutive cases for the calibration process to be considered complete. The evaluators were released to analyze the other cases only after reaching this index.

Agreement between raters (inter-rater) was tested, with each pair of raters carrying out the analysis individually. To test the agreement of the evaluators with themselves (intra-evaluator), ~ 20 to 30% of the sample, by age group, was considered (randomly selected cases). The reassessments (retest) by the same examiner took place with an interval of at least 15 days from the initial assessment, to avoid the memory effect. Inter- and intraexaminer agreement was considered poor when < 0.4, from fair to good when between 0.4 and 0.7, and excellent when > 0.7.[15]

MMBGR scores by domain and subdomain were described using mean, standard deviation (SD), median and interquartile interval. The hypothesis of adherence of continuous variables to normal distribution was tested using the Shapiro-Wilk test.[16] Once this hypothesis was rejected, the hypothesis of differences in the medians was tested using the Mann-Whitney test.[17]

The size of the differences was quantified using Cohen d effect size, which can be classified as negligible ($|d| < 0.2$), small ($0.2 \le |d| < 0.5$), medium ($0.5 \le |d| < 0.8$) or large ($|d| \ge 0.8$).[18] Spearman correlations were calculated, whose modulus can be interpreted as weak ($0.1 \le |R| < 0.3$), moderate ($0.3 \le |R| < 0.7$), strong ($|R| \ge 0.7$) and ideal when equal to 1.0.[19] The significance level adopted was 5% and the software used was R Core Team 2021, version 4.0.1 (R Foundation, Vienna, Austria).

We performed sample size[20] for an unpaired, two-sided $t$ test with the $\alpha$ significance level, $\beta$ type II error, Cohen $d$ effect size, and $\phi$ case-control proportion; sample size $n$ could be achieved by the equation below:

$$n = \left[\frac{(1+\varphi)^2}{\varphi}\right]\frac{\left(Z_{1-\alpha/2}+Z_{1-\beta}\right)^2}{d^2}+\frac{\left(Z_{1-\alpha/2}\right)^2}{2}$$

where $Z_{1-\alpha/2}$ score from the normal distribution associated with the $\alpha$ significance level and $Z_{1-\beta}$ score from the normal distribution associated with the $\beta$ type II error. Assuming a 5% significance level, 80% of power, a small to medium effect size ($d = 0.42$), and a 1:1 case-control proportion, the sample size is 180 infants and preschoolers. However, as long as there is no guarantee of normality assumption, a nonparametric test like the Mann-Whitney test would be preferred. Applying the method of asymptotic relative efficiency, which consists of dividing the sample size obtained above by the factor of 0,864,[21] we obtain 210 infants and preschoolers.

## Results

As for the characterization of the population, of the 214 participants, 76 (35.51%) were nursing infants (6 to 23 months old), 35 (46%) were female and 41 (54%) were male; and 138 (64.49%) were preschoolers (24 to 71 months old), 79 (57.25%) were female and 59 (42.75%) were male.

All the results presented below refer to the comparison between the sexes, both of nursing infants and preschoolers, according to the opinion of specialist speech therapists, and most items of the Extraoral Examination, Intraoral Examination, Mastication obtained agreement classified as reasonably good or even excellent. The items Breathing, Deglutition, and Speech had values > 0.4 in all age groups.

In intraoral and extraoral examinations, there was a significant difference between sexes only for tongue scores in nursing infants (d = - 0.428; $p = 0.045$), worse (higher score) in males. The other subdomains and domains showed no differences between sexes (►**Table 1**).

In nursing infants, considering the orofacial functions, significant differences were observed between the sexes only for the liquid/solid/semisolid deglutition scores (d = 0.479; $p = 0.031$), worse (higher score) in females (►**Table 2**).

In preschool children, significant differences were observed between sexes for orofacial function scores (d = - 0.439; $p = 0.007$), including the total score (d = - 0.357; $p = 0.037$). Specifically, differences were found for solid/semisolid deglutition (d = - 0.335; $p = 0.043$) and Speech (d = - 0.478; $p = 0.034$), including in the production of phones/phonemes (d = - 0.599; $p = 0.007$), always worse (higher scores) in males. The other subdomains and domains showed no significant difference between sexes (►**Table 3**).

In nursing infants, there were weak correlations between tongue and lip posture (R = 0.23; $p = 0.045$) and between tongue and cheek mucosa (R = 0.27; $p = 0.017$). There was a moderate correlation between liquid/solid/semisolid deglutition and teeth and occlusion (oral health of teeth and gums) (R = 0.31; $p = 0.006$); as well as total score (intraoral and extraoral exams and orofacial functions) (R = 0.52; $p = < 0.001$) ►**Fig. 1**.

In preschoolers, there were weak correlations between speech and lip posture (R = 0.25; $p = 0.004$), intraoral examination structures (R = 0.23; $p = 0.009$), such as: cheeks (R = 0.24; $p = 0.006$), tongue (R = 0.18; $p = 0.035$); tonus of upper and lower lips (R = 0.22 ; $p = 0.01$) and cheek tonus (R = 0.2; $p = 0.022$); in addition to moderate correlations with jaw posture (R = 0.36; $p \le 0.001$), tongue tone

 

**Table 1** Scores of domains and subdomains related to the Intraoral and Extraoral Examination (MMBGR) by sex and age group (Nursing Infants/Preschoolers), 2019, Brazil

| | | Female | | Male | | | |
|---|---|---|---|---|---|---|---|
| | Maximum score | $\bar{x}$ (SD) | M (IQI) | $\bar{x}$ (SD) | M (IQI) | *p-value* | d |
| **Nursing infants** | | ($n = 35$) | | ($n = 41$) | | | |
| **Extraoral examination** | 20 | 5.74 (2.93) | 5 (4–8) | 6.37 (2.97) | 6 (4.5–8.5) | 0.345 | −0.211 |
| Face | 10 | 1.54 (1.62) | 1 (0–2) | 2.1 (1.89) | 2 (0–3) | 0.209 | −0.313 |
| Lips | 9 | 3.54 (1.87) | 4 (2–5) | 3.61 (1.87) | 4 (2–5) | 0.979 | −0.036 |
| Mandible | 1 | 0.66 (0.48) | 1 (0–1) | .66 (0.48) | 1 (0–1) | 0.995 | −0.003 |
| **Intraoral examination** | 42 | 3.51 (2.93) | 3 (1–5) | 3.9 (2.62) | 3 (2–6) | 0.485 | −0.140 |
| Lips | 5 | 0.6 (0.88) | 0 (0–1) | 0.59 (0.81) | 0 (0–1) | 1.000 | 0.017 |
| Cheeks | 6 | 0.2 (0.58) | 0 (0–0) | 0.12 (0.46) | 0 (0–0) | 0.540 | 0.150 |
| Tongue | 13 | 1.2 (1.37) | 1 (0–2) | 1.8 (1.45) | 1 (1–2.5) | 0.045 | −0.428 |
| Palate | 10 | 0.69 (1.39) | 0 (0–0) | 0.76 (1.39) | 0 (0–1.5) | 0.741 | −0.051 |
| Palatine tonsils | 4 | 1.83 (1.59) | 2 (0–3.5) | 1.58 (1.68) | 1.5 (0–3.5) | 0.692 | 0.153 |
| Teeth and occlusion | 4 | 0.2 (0.76) | 0 (0–0) | 0.17 (0.54) | 0 (0–0) | 0.666 | 0.045 |
| **Preschoolers** | | ($n = 79$) | | ($n = 59$) | | | |
| **Extraoral examination** | 20 | 7.16 (3.15) | 7 (5–9) | 8.05 (3.16) | 8 (6–10) | 0.076 | −0.281 |
| Face | 10 | 3.39 (2.33) | 3 (1–5) | 3.92 (2.25) | 4 (2–6) | 0.149 | −0.228 |
| Lips | 9 | 3.35 (1.78) | 3 (2–5) | 3.59 (1.88) | 4 (2–5) | 0.459 | −0.131 |
| Mandible | 1 | 0.42 (0.5) | 0 (0–1) | 0.54 (0.5) | 1 (0–1) | 0.149 | −0.249 |
| **Intraoral examination** | 56 | 10.51 (4.7) | 10 (7–13) | 10.53 (4.5) | 10 (6–15) | 0.983 | −0.004 |
| Lips | 5 | 0.7 (0.95) | 0 (0–1) | 0.51 (0.8) | 0 (0–1) | 0.277 | 0.214 |
| Cheeks | 8 | 0.68 (1.03) | 0 (0–2) | 0.61 (0.95) | 0 (0–1) | 0.799 | 0.074 |
| Tongue | 16 | 2 (1.72) | 2 (1–3) | 2.24 (1.6) | 2 (1–3) | 0.268 | −0.143 |
| Palate | 10 | 2.47 (1.73) | 2 (1–4) | 2.32 (1.56) | 2 (2–4) | 0.591 | 0.089 |
| Palatine tonsils | 4 | 2.03 (1.58) | 2 (0–4) | 2.27 (1.55) | 2 (1.25–4) | 0.420 | −0.154 |
| Teeth and occlusion | 13 | 2.91 (2.23) | 3 (1–5) | 3 (2.17) | 3 (1–4) | 0.797 | −0.040 |

Abbreviations: $\bar{x}$, mean; d, Cohen d size effect; IQI, interquartile interval; M, median; SD, standard deviation.
Mann-Whitney Test;

($R = 0.32$; $p \leq 0.001$) and total score (intraoral and extraoral exams, tone and orofacial functions) ($R = 0.58$; $p \leq 0.001$).

Also in preschoolers, specifically for the production of phones/phonemes, there were weak correlations with lip posture ($R = 0.2$; $p = 0.02$), mandible ($R = 0.25$; $p = 0.003$), breathing ($R = 0.19$; $p = 0.028$), chewing ($R = 0.25$; $p = 0.004$), lips tonus ($R = 0.17$; $p = 0.045$), and tongue tonus ($R = 0.17$; $p = 0.047$). There were moderate correlations with orofacial functions ($R = 0.5$; $p < 0.001$), with general aspects of speech articulation ($R = 0.45$; $p < 0.001$), and total score ($R = 0.36$; $p < 0.001$).

Weak correlations were also found between semisolid/solid deglutition and lip posture ($R = 0.28$; $p = 0.001$), intraoral examination ($R = 0.29$; $p = 0.001$), specifically for the palate ($R = 0.\ 0.28$; $p = 0.001$), teeth and occlusion (number of teeth and oral health of teeth and gums) ($R = 0.23$; $p = 0.006$), palatine tonsils ($R = 0.21$; $p = 0.021$), and speech ($R = 0.2$; $p = 0.022$); as well as moderate correlations with the extraoral exam ($R = 0.3$; $p \leq 0.001$), specifically for the mandible ($R = 0.34$; $p \leq 0.001$), with the orofacial functions ($R = 0.65$; $p < 0.001$), specifically breathing ($R = 0.31$; $p < 0.001$), chewing ($R = 0.38$; $p < 0.001$), liquid deglutition ($R = 0.4$; $p < 0.001$), tone ($R = 0.32$; $p \leq 0.001$) and total score ($R = 0.6$; $p \leq 0.001$) ►**Fig. 2**.

## Discussion

The items in which significant differences were found between the sexes are highlighted, including their correlations, considering the domains of the Orofacial Myofunctional Clinical Examination Protocol of the MMBGR Protocol – Nursing Infants and Preschoolers.[12]

There were no variations in orofacial structure between sexes in most of the hypotheses investigated, both in nursing infants and in preschoolers. This lack of distinctions is explained by the fact that structural changes are not noticeable until ~ 6 years old, when > 90% of the cranial vault and skull base, as well as 80% of the mandibular bones and jaws, have grown.[22]

 

**Table 2** Scores of domains and subdomains related to Orofacial Functions (MMBGR Clinical Examination Protocol) by sex in nursing infants, Brazil, 2019

| Nursing infants | | Female ($n = 35$) | | Male ($n = 41$) | | | |
|---|---|---|---|---|---|---|---|
| | Maximum score | $\bar{x}$ (IQI) | M (IIQ) | $\bar{x}$ (SD) | M (IQI) | *p-value* | d |
| **Orofacial functions** | 46/92 | 10.03 (5.71) | 11 (5–13) | 8.9 (4.35) | 8 (6–12) | 0.468 | 0.224 |
| Breathing | 2 | 0.66 (0.54) | 1 (0–1) | 0.66 (0.48) | 1 (0–1) | 0.926 | −0.003 |
| Suction/deglutition | 22 | 1.78 (1.93) | 1 (0.75–2) | 2.38 (2.85) | 1 (0–4) | 0.884 | −0.237 |
| Mastication | 13 | 2.95 (1.88) | 3 (2–4) | 2.8 (1.66) | 3 (1–4) | 0.947 | 0.085 |
| Liquid/pasty deglutition | 37 | 4.66 (3.14) | 4 (3–6) | 4.56 (3.13) | 4 (2–7) | 0.971 | 0.031 |
| Liquid/solid/semisolid deglutition | 32 | 4.91 (4.83) | 5 (0–9) | 2.76 (4.21) | 0 (0–6) | 0.031 | 0.479 |
| Solid/semisolid deglutition | 17 | 4.1 (2.57) | 4 (3–5) | 3.73 (1.87) | 4 (2–5) | 0.761 | 0.159 |
| Pasty deglutition | 22 | 4.29 (3.1) | 3 (2.5–5.5) | 5.2 (2.89) | 5 (3–7) | 0.228 | −0.305 |
| Liquid deglutition | 15 | 3.91 (2.48) | 5 (1–6) | 3.56 (2.56) | 3 (1.25–5) | 0.516 | 0.139 |
| **Total score** | 218/264 | 20.2 (8.05) | 20 (14–25) | 20.27 (7.37) | 20 (15–24) | 0.946 | −0.009 |

Abbreviations: $\bar{x}$, mean; d, Cohen d size effect; IQI, interquartile interval. M, median; SD, standard deviation.
Mann-Whitney Test.

**Table 3** Scores of the Orofacial Functions and Total (MMBGR Clinical Examination Protocol) domains by sex in preschoolers, Brazil, 2019

| Preschoolers | | Female ($n = 79$) | | Male ($n = 59$) | | | |
|---|---|---|---|---|---|---|---|
| | Maximum score | $\bar{x}$ (SD) | M (IQI) | $\bar{x}$ (SD) | M (IQI) | *p-value* | d |
| **Orofacial functions** | **53/68** | **15.33 (6.37)** | **14 (11–19)** | **18.2 (6.73)** | **20 (14–24)** | **.007** | **−.439** |
| Breathing | 2 | .65 (0.53) | 1 (0–1) | .69 (0.56) | 1 (0–1) | .651 | −.090 |
| Mastication | 13 | 3.97 (1.67) | 4 (3–5) | 3.88 (2.06) | 4 (3–6) | .913 | .050 |
| Solid/semisolid deglutition | 15 | 4.23 (2.08) | 4 (3–5) | 4.97 (2.32) | 5 (3–7) | .043 | −.335 |
| Liquid deglutition | 17 | 3.68 (2.28) | 4 (2–5) | 4.29 (2.02) | 4 (3–6) | .121 | −.281 |
| Speech | 21 | 2.91 (2.66) | 2 (1–4) | 4.53 (3.98) | 3 (1–7) | .034 | −.478 |
| Production of phones/phonemes | 6 | 1.18 (1.29) | 1 (0–2) | 2.23 (2.1) | 2 (0–4) | .007 | −.599 |
| General aspects of speech articulation | 15 | 2.38 (2.09) | 2 (0–4) | 2.85 (2.42) | 3 (0.75–5) | .430 | −.206 |
| **Total score** | 154/169 | 35.08 (11.52) | 34 (27–44) | 39.27 (11.99) | 40 (30–50) | .037 | −.357 |

Abbreviations: $\bar{x}$, mean; d, Cohen d size effect; IQI, interquartile interval; M, median; SD, standard deviation.
Mann-Whitney Test.

The intraoral exam revealed only a difference in tongue scores in nursing infants, with males having lower findings, which corresponds to a study[23] that identified a higher incidence of frenulum abnormalities in boys. Another study[4] found that similar changes are common in newborn males. When a change in the lingual frenulum is discovered during a global orofacial myofunctional test, the adoption of special protocols for assessing this structure is recommended.[24]

In nursing newborns, there was also a weak association between tongue and lips posture at rest (closed, parted, or open lips). This is in contrast to a study[23] that showed no correlations between these characteristics. The analysis of tongue and lip position, in combination with the other evaluation criteria, is thought to aid in identifying any abnormalities in the lingual frenulum.

Females recorded the lowest scores in terms of liquid/solid/semisolid deglutition capabilities in nursing infants. This data corresponds to a study on the acoustic characteristics of deglutition in children under the age of twelve months diagnosed with bronchiolitis, in whom sexual disparities were noted, with girls having a higher number of swallows.[25]

Also, regarding nursing infants, there was a moderate correlation between deglutition changes of different consistencies and oral health of teeth and gums (intraoral and extraoral examinations and orofacial functions), in addition

 

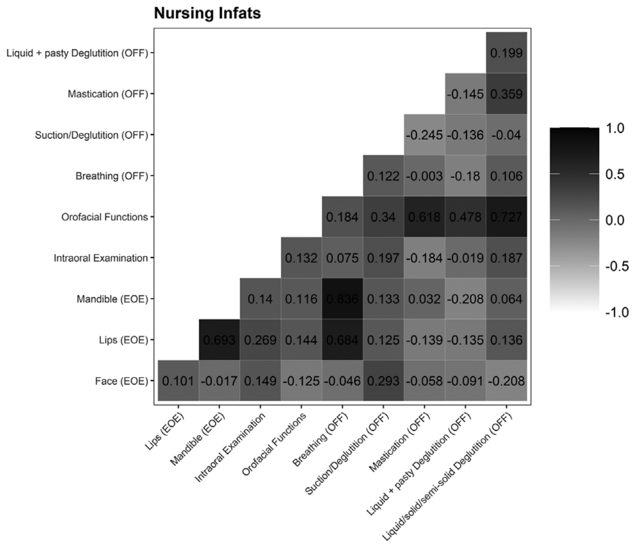


**Fig. 1** Correlogram between domains and subdomains of MMBGR for Nursing Infants. *Source: Authors

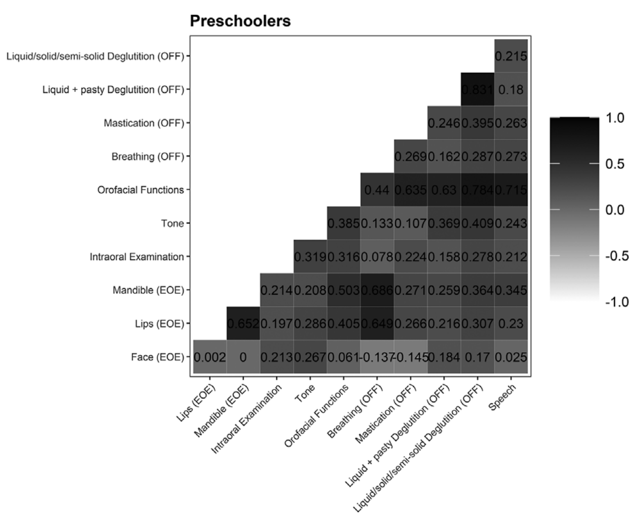


**Fig. 2** Correlogram between domains and subdomains of MMBGR for Preschoolers. *Source: Authors.

to the total score. It is thought that changes in the stomatognathic system can lead to problems with the orofacial structures even at a young age.

Males had lower scores in semisolid/solid deglutition than females in preschoolers. Despite the fact that no additional research comparing deglutition across sexes in this age group have been found; the study showed opposite results, with greater difficulty in deglutition in women, when adults and without dysphagia.[7] More research into the pattern of deglutition in different sexes and age groups is needed.

The correlations between deglutition and certain orofacial structures and functions coincide with the literature that refers to changes in deglutition in the presence of malocclusion and dysfunctions in the motions and posture of the jaw and tongue,[26] in addition to phonoarticulation and muscle tone.[27] Deglutition is thought to be a complicated sensorimotor action involving mouth and tongue muscular processes, therefore any failure in one of these events can affect its functioning.[28]

Differences in speech between the sexes were also observed in preschoolers, with boys scoring lower, which corresponds to research that addresses more language usage issues connected to phonological and communicative features, which include articulatory abnormalities in the speaking of boys.[29] Furthermore, given the higher incidence of abnormalities in males, the influence of lingual frenulum modifications on orofacial functions should be examined.

The speech-related correlations reveal that this function is linked to the morphophysiology of the stomatognathic system.[3] The neuromotor maturation of speech is associated with the integration of orofacial structures such as the lips and tongue, as well as the regularity of reciprocal movements with the mandible, which is characterized as an end product of various linguistic, cognitive, and sensorimotor processes.[9]

The findings of the present study findings contribute to a better understanding of the oromyofunctional domains of nursing infants and preschoolers based on sex. However, we consider it a limitation of the present study that our data could not yet be compared with other populations, because the clinical examination through the MMBGR Protocol – Nursing Infants and Preschoolers[12] was applied in a pioneering manner, at a time when speech-language pathology professionals were not yet fully available. Beyond that, the protocol was built for Brazilian Portuguese speakers and the use to investigate the orofacial myofunctional profile in another population needs cross-cultural validation.

It is recognized that oromyofunctional assessment at a young age must be performed using standardized instruments, allowing for the detection of potential changes and prompt therapeutic intervention.[30] It is worth noting that the MMBGR Protocol – Nursing Infants and Preschoolers[12] has already been submitted to an important open access speech therapy scientific journal, and may soon contribute to the expansion of studies related to the target audience.

## Conclusion

The present study demonstrated sex differences and related the domains of the oromyofunctional assessment, according to scores, of nursing infants and preschoolers, as recorded in a standardized oromyofunctional assessment protocol by age group.

Males performed worse on the clinical examination in general. The item corresponds to the tongue in nursing infants and the semisolid/solid deglutition, semisolid/solid deglutition, and speech in preschool children. Only nursing infants had lower scores in the orofacial functions of liquid/solid/semisolid deglutition in females. In general, regardless of sex, the correlations found in the domains of orofacial functions when related to orofacial structures were stronger in nursing infants and preschoolers.

The structural and functional aspects of the orofacial region, as well as their correlations, are important for clinical and research in OM, considering differences between sexes in different age groups. It is worth noting that the use of standardized protocols can aid in the comparison of groups in the various domains of the assessment, as well as in the comparison and design of intervention strategies.

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Conflict of Interests
The authors have no conflict of interests to declare.

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