Written register of nasality in preschool children

O registro escrito da nasalidade em crianças de educação infantil

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ABSTRACT

Purpose: To verify how children in the last year of preschool register nasality in their writing, observing these registers regarding syllabic positions of onset and coda, as well as the phonological classes involved in substitution cases. **Methods:** The material used came from a writing activity conducted with 19 children enrolled in the last level of preschool. It was carried out a guessing game, in which children should write the names of 24 fruits. Fifteen of those names showed nasality context. The main parameter for analysis was the syllabic position of nasal graphemes in Portuguese. **Results:** Most children wrote down the nasality, with more occurrence in syllable onset position. In this position there was a higher number of conventional registers, while in coda position the non-conventional registers prevailed. Substitutions occurred mainly among graphemes that corresponded to the sonorants class. **Conclusion:** The relevance of syllabic constituents is high for the characterization of the points of lowest and highest difficulty in the acquisition of nasality in writing. It is also relevant how children retrieve phonetic-phonological similarities among nasal graphemes that they substitute and those that are substituted.

Keywords: Handwriting; Child language; Learning; Child teaching; Language development

INTRODUCTION

It's during the period of bond establishment between phonetic-phonological aspects of the language and its written aspects (bonds which start to develop, mostly, in the beginning of literacy) that we can set the aim of this investigation – nasality writings within the syllable.

Such bonds have been systematically investigated[1-25]. While investigating them, researches have turned either to writing aspects such as non-conventional segmentations[4,8-11], or to substitutions and spelling omissions[1-3,5-7,12-25], in studies based mainly on data obtained from writings of Elementary School students. Nevertheless, the introduction of writing issues as early as in Preschool has become more and more frequent in our country – making it relevant to understand how, in the period that officially precedes children's involvement with writing, they start to establish bonds between phonetic--phonological issues and orthographic issues. Therefore, besides approaching a theme not exclusively and specifically studied in specialized literature (the writing of nasality), this article will approach the writing purpose of students attending the last year of preschool.

Since the syllable is the unit in which the results of this investigation are based, it's fundamental to define the characteristics of this language constituent. The syllable is a highly complex constituent, which can be defined both by its physical characteristics (in speech), and by its symbolic characteristics (in the language). Thus, in language studies, the syllable can be seen under two main perspectives: the phonetic[26-28] and the phonological[27-29].

The phonetic perspective investigates physical characteristics of the syllable: the motor (related to its articulation), the acoustic (related to the distribution of sound energy) and the auditory-perceptual (how ears capture sound waves)[26-28].

On the other hand, the phonological perspective investigates the symbolic characteristics of the syllable[27-29]. Since the beginning of the 80's last century, the syllable has been seen as a phonological unit having a non-linear structure of constituents organized according to an internal hierarchy[29].

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Received: 10/7/2010; **Accepted:** 5/17/2011

In this pattern, the syllable would have two main constituents: the onset and the rhyme. The latest – the rhyme – can be split in two parts: the nucleus, which in Portuguese is mandatorily filled by vowels and the coda, filled by one or two final consonants or by a semivowel, followed or not by a consonant. As there are phonotactic restrictions between coda and nucleus, the coda must, therefore, be considered an extension of the nucleus, both belonging to the rhyme.

In phonological terms, in Portuguese, both the onset and the coda position may be filled by phonemes and nasal archiphonemes. In the onset, the fulfillment can be done by the phonemes /m/, /n/ or /ɲ/ – in orthographic terms, registered respectively in the conventional Portuguese writing by the graphemes "m", "n" e "nh". In the coda, the fulfillment occurs by what is classified as nasal archiphoneme /N/ – in orthographic terms, registered by M (such as in *caMpo*), by N (such as in *caNto*) or by the graphic symbol ~ on top of the vowel (such as in *irmã*).

Since children's writing in the beginning of literacy shows (among many others) conflicts involving nasality[16,22], in order to understand them better and, therefore, emphasize the role that Speech-Language Pathology and Audiology plays in language acquisition, this investigation had the following objectives: to verify to which extent children attending the last year of preschool register nasality in their writings, whether or not obeying orthographic rules; to verify to which extent their writings (whether obeying or not spelling rules) would be dependent on syllabic position of onset or coda; to verify to which extent the syllable position would relate to conventional and non-conventional writings; and to verify to which extent the substitutions would occur within the major phonological classes.

METHODS

The material used came from an activity held in the classroom by the speech-language pathologist responsible for collecting the data for the *corpus*. The students were required to write previously established words. These words corresponded to the names of 24 fruits, given that is a very diversified semantic field, with numerous options of words and phonological settings, and also because of the fact that children would already be familiar with such vocabulary, since the teacher had already worked orally on those words in class.

Among the 24 fruits, 15 had nasality context. Within these 15 names, the onset nasality (such as the "m" in the word "*melão*") and the simple coda nasality (such as the "n" in the word "*manga*") were considered in the syllable. The syllabic nucleus and the complex codas (such as "ão" in the word "*limão*") were not taken into account in this study. These 15 names were: *pinha*, *romã*, *morango*, *limão*, *ameixa*, *mamão*, *melão*, *amora*, *ponkan*, *laranja*, *carambola*, *banana*, *maçã*, *melancia* and *manga*.

Since some words had more than one possibility of nasality writing, 23 possibilities were raised: 14 related to the onset position (pi*nh*a, ro*m*ã, *m*orango, li*m*ão, a*m*eixa, *ma*mão, *m*elão, a*m*ora, ba*n*a*n*a, *m*açã, *m*elancia, *m*anga); and 9 related to the coda position (rom*ã*, mora*n*go, po*nk*a*n*, lara*n*ja, cara*m*bola, maç*ã*, mela*n*cia, ma*n*ga).

The written records were produced by 19 children of both genders, aged between 5 and 6 years old, who were enrolled in the last year of a public preschool in 2007. Thus, the total number of possibilities expected for nasality writing would be 437 (23 possibilities x 19 children). However, as two children didn't complete the activity, we reached a total of 414 possibilities of nasality writings: 252 in the onset and 162 in the coda.

To start the activity, the children were given two sheets of paper containing 12 pictures of fruits in each sheet with a line beside each fruit where they should write down their names.

To contextualize the proposal, a guessing activity was held. The speech-language pathologist took a random picture out of a bag and didn't show it to the subjects, giving them some clues of the picture raffled. As soon as everyone guessed which was the fruit, the researcher showed the picture and asked them to write down the name of the fruit.

To look for nasality writing interpretations, subsides of phonetic-phonological studies about the syllable were used[26-30].

The people responsible for each participant in the study gave their formal written permition according to the information available in the Free and Informed Consent that was presented to them. The research was approved by the Research Ethics Committee of the School of Philosophy and Sciences of the Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP/Marília), registered under the number 3459/2008.

Data were statistically analyzed based on the non-parametric Wilcoxon test, using the Statistica software (version 7.0). With respect to the first objective of the research, the dependent variables were the percentages of nasality writings and non- writings; as for the second objective, each part of the syllable was considered a dependent variable: the percentage of onset writings and coda writings; regarding the third objective, the dependent variables were the conventional and non-conventional aspects of the writings, and the independent variables were the onset and coda syllabic positions; finally, as for the forth objective, the dependent variables were the classes of sonorants (which includes: nasals, laterals, taps, thrills e approximants) and obstruents (which includes: stops, fricatives e affricates). The level of significance was $\alpha \leq 0.05$, with a confidence interval of 95%.

RESULTS

To guarantee that the objective of verifying to which extent children in preschool write down nasality, the number of possibilities of nasality writings in onset and coda syllabic positions within the selected words was initially raised. All of the children's nasality recordings were taken into account, whether they obeyed orthographic rules or not.

It was verified that, from the 414 possibilities, there were 324 registrations of nasality, which corresponded to 79% of the occurrence possibilities (Figure 1). As observed, the subjects preferably registered, somehow, the nasality in their writings. This percentage was significant (Z=3.82, p=0.0001).

Concerning the second objective – to verify to which extent the nasality writings would be dependent on the syllabic

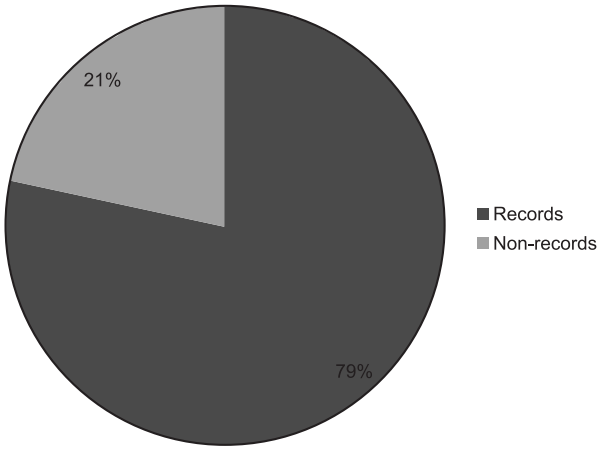

Figure 1. Percentage of nasality records and non-records

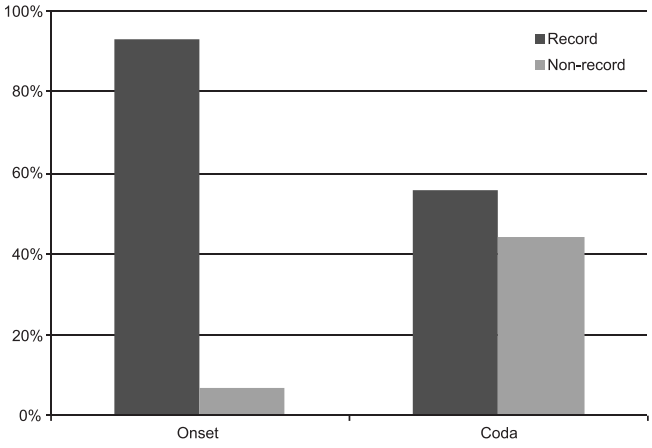

Figure 2. Percentage of records and non-records X syllable position

positions of onset and coda – the 414 possibilities of writings were distributed according to the syllabic position of onset (252) and coda (162) (Figure 2).

As it can be observed, in the onset position, from a total of 252 possibilities of writings, 235 (93%) were used by the subjects. In the coda position, from a total of 162 possibilities, 90 (56%) were registered. There is, therefore, a greater percentage of nasality writings in the syllabic onset (93%) than in the syllabic coda (56%). This difference was proved (Z=3.62, p=0.0002).

Examples of these types of nasality writings are presented in Appendix 1.

Regarding the third objective – to verify to which extent the syllable position would relate to conventional and non-conventional writings, Figure 3 shows the results.

The results once again show that children seem not to present any problems registering the nasality in syllable onset, since, among all the other possibilities, 189 (80.42%) were written conventionally, and 46 (19.58%) non-conventionally – a difference that was significant (Z=3.29, p=0.0009). The coda was, once again, a more complex position for the children: when registered, 63 occurrences (70%) were non-conventional, and 27 (30%) conventional, and this difference was significant (Z=2.11, p=0.0346).

Appendix 2 presents some examples of conventional and non-conventional writings.

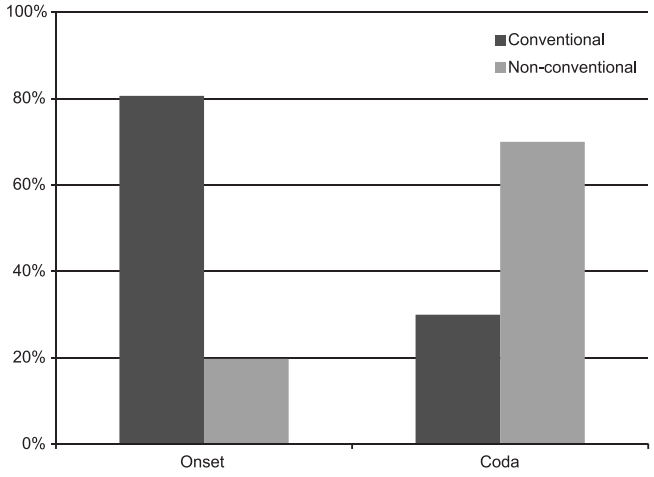

Figure 3. Conventional and non-conventional records X onset and coda positions

Finally, the forth objective was to verify, in the cases where the onset writings differed from the conventions, whether or not the substitutions occurred within the major phonological classes. The non-conventional recordings of nasal coda were excluded due to the fact that, in Portuguese, the nasality is not contrastive in this syllabic position, unlike what happens in the onset position. The results related to the forth objective are presented in Figure 4.

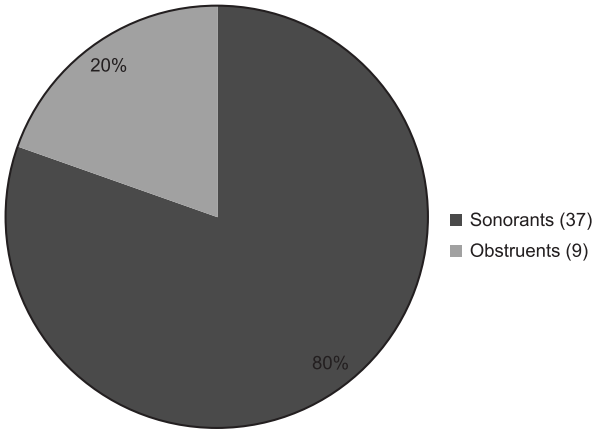

Figure 4. Major classes X syllabic onset substitutions

From 46 non-conventional occurences in the syllabic onset, 37 (80%) were substitutions within the the major class of sonorant phonemes (which involves nasal and lateral and non-lateral liquids), and only nine substitution occurences (20%) were within the class of obstruents (which comprises stops, fricatives and affricates). This substitution tendency of preferably using graphemes within the major class of sonorants was significant (Z=2.40, p=0.0163).

More specifically, in the substitutions within the major class of sonorants, the grapheme most used in substitutions was the "n" (=26), especially in cases of substitutions of "m" for "n". The least preferred were the graphemes "m" and "l" (=8, four each), "r" (=2), and, finally, the digraph "nh" (=1). Hence, from the 37 substititutions, 31 (83.78%) occurred among nasal graphemes; the other six (16.22%) were changed

from nasal graphemes into the lateral liquid "l" and into the non-lateral liquid "r".

Specifically regarding the nine substitutions for obstruents, seven of them (77.77%) substituted the grapheme "m" for the grapheme "b", and two (22.23%) the same grapheme "m" for the grapheme "g".

Examples of the substitutions within major classes of phonemes are shown in Appendix 3.

DISCUSSION

Regarding the results concerning the first objective, children preferably registered the nasality (Z=3.82, p=0.0001). On the one hand, this preference indicates that children are sensitive to the acoustic and perceptual-auditory characteristics of the nasality detected in the oral practice and try to write them in their texts. On the other hand, this preference also points at the efficiency of the literacy teaching techniques in which the children are involved (mostly, those developed at school), since they registered the nasality graphemes more than they omitted. Effectively, during the literacy practices developed in the classroom of the children belonging to this study, both the different syllabic families and the relation grapheme/phoneme within the syllable were approached.

As for the results referring to the second objective, there was prevalence for nasality writings of the syllabic onset over coda (Z=3.62, p=0.0002). In other words, the coda position was the most difficult for nasality writings.

To understand this difficulty, from the phonetic point of view, it's possible to indicate three parts in the syllable, two peripheral (the slopes) and a central or nuclear part (the acme)[26]. Although both onset and coda correspond to peripheral parts (positions which contrast in acoustic energy with the nuclear position, where the energy reaches its peak)[28], the onset position corresponds to a moment of muscular strength intensification (and, consequently an increase in acoustic energy), opposed to the coda position, which corresponds to a moment of reduced strength (an energy reduction). This difference in the muscular strength meaning and in the distribution of acoustic energy favors, therefore, children's better auditory perception of onset over coda- fact that explains the nasality writing difference in this two positions.

It's also possible to phonologically interpret this difference. In Portuguese, we can verify the phonological contrast of nasal consonants in onset position (as, for example, the change of a grapheme N into a grapheme M can result in different word meanings, as it occurs in the contrastive pattern "mata"/"nata"). Therefore, the differentiation (besides perceptual-auditory characteristics) favors the perception of onset nasality, having a higher percentage of writings. Unlike the coda, the nasal phonemes are neutralized, resulting in a single archiphoneme: the /N/. This way, the absence of differentiation in the coda could make perception difficult, leading children not to write it in their texts. This absence of differentiation, explains then, the lower percentage of writings in coda position.

Regarding the results about the third objective, we verified that the children preferably registered the nasality according to spelling rules in the onset (Z=3.29, p=0.0009) and preferably not according to spelling rules in the coda (Z=2.11, p=0.0346).

Once more, the presence *versus* the absence of phonological contrast among nasal phonemes in Portuguese can explain the prevalence of conventional writings in the onset and non-conventional ones in the coda – the nasality phonetic characteristics per say. Nonetheless, at least concerning the onset conventional writings, we must take into account the efficiency of the literacy practices developed at school, for the reasons mentioned above, since the children's writings also show that they can mark, with different graphemes, the differences they notice among the nasal phonemes in this syllabic position.

Finally, as for the results referring to the forth objective, we verified that the spelling substitutions involving nasal phonemes tended to preferably occur using graphemes of the major class of sonorants (Z=2.40, p=0.0163). Within this major class, we also verified that from the 37 occurences 31 (83.78%) occurred among nasal graphemes and the remaining six (16.22%) were from nasal graphemes to graphemes that resembles the lateral liquid "l" and the non-lateral liquid "r". Yet, among the substitutions of nasal graphemes resembling the major class of obstruents, seven (77.77%) changed the grapheme "m" into the grapheme "b", and two (22.23%) changed the grapheme "m" into the grapheme "g".

More specifically, in the substitutions involving sonorants, as 83.78% occurred among different nasal graphemes, we observe that preferably, the children oscillated among more subtle nasal distinctions within a single class. In other words, the group of nasal phonetic phonemes, the voicing ones, with air outflow with low turbulence and nasal resonance seems to have been easily noticed by children, since they registered the perception they had from this group of characteristics using a grapheme related to the nasal class- specially: "n", a preference already pointed out in previous studies[16,19]. This preference also shows that the nasal phoneme characteristic, which seems to be the most difficult to be identified by children is the one that distinguishes the three different points of articulation of the three nasals to be known: labial, in /m/; dental, in /n/; palatal, /ɲ/. Much less, 16.22% of the substitutions within the major class of sonorants were nasal graphemes changed into graphemes that resembled phonemes of the lateral and non-lateral liquid classes. In this case, phonetic characteristics common to the elements of the major phonological class of the sonorants seem to explain this preference of substitutions. The children seem to detect, in the sonorants, perceptual-auditory characteristics which come mainly from sonorants produced in speech with voicing followed by an air outflow with low turbulence and also, in the case of lateral liquids and nasals, there are formant regions well defined, besides the presence of anti-formants. This group of characteristics seems to explain why the children have not only substituted nasal graphemes within the major class of sonorants, but also changed graphemes into those resembling the liquid.

Regarding the few occurrences involving graphemes resembling the phonemes of the major class of the obstruents (class phonologically farther from the sonorants), they also seem to have, in their basis, the detection of phonetic characteristics which are common for the children. As we could

observe, in 77.77% of the substitutions the grapheme "m" was changed into the grapheme "b" and in 22.23% the same grapheme "m" was changed into the grapheme "g". The preference for grapheme "b" involves the concurrently detection of voicing characteristics and of articulation points present in the phonemes /m/ and /b/, which resemble, respectively, the graphemes 'm' and 'b'.

Even the few substitutions of the grapheme "g" are supported, in phonetic terms, by at least one common characteristic: the voicing – present in the phonemes /m/ and /g/, which resemble the graphemes "m" and "g" (within the context the substitutions occurred).

Thus, all the nasal grapheme substitution cases, whether changed into graphemes resembling the great class of sonorants or of obstruents, dealt with at least one common phonetic characteristic among the subjacent phonemes to the nasal graphemes and the subjacent phonemes to the graphemes for which they were substituted.

These results were not compared to literature due to the fact that studies with the same theoretical-methodological focus of this investigation were no found; not even with the same specifically investigated theme, the nasality in children's writings in preschool education.

CONCLUSION

We focused on the nasality writing made by children in the last year of preschool. Two facts were very relevant in such writing. The first one is about the high relevance of syllable constituents to feature the points of higher and lower difficulty in the acquisition of the nasality writing. The second is about the children's rescuing similar phonetic-phonological characteristics among the nasal graphemes they substitute and those for which they are substituted.

The results from the group of children in this investigation point that it's not appropriate to deal with nasality writings in different syllabic positions the same way it was done here. The difference of conventional writings in onset and coda position was very big; therefore, a mistake in nasality writing should not have the same value for both positions. In coda position, such mistakes are much more repetitive in the children's writings (due to nasality phonetic-phonological characteristics previously described) than in onset position.

More specifically, about the substitutions, we observed that, mostly, they occurred among graphemes resembling phonemes which held among them, very close phonetic-phonological characteristics. This is maintained due to the fact that: graphemes resembling nasal phonemes were substituted, preferably for graphemes which resembled this same phonological class; such graphemes were substituted for others which resembled the liquid class – which share sonorant characteristics with the nasals; in the few remaining cases, the substitutions kept in common at least the characteristics of articulation point and/or voicing.

Consequently, an assessment tool should take into account the highest and lowest occurrence probability of mistakes in nasality writing; whether it is in coda position (higher probability) or in onset position (lower probability). In other words, a high percentage of mistakes in onset should be seen more attentively than the same percentage in coda. Analogously, the substitutions should also be analyzed, mainly based on a higher or lower number of phonetic-phonological characteristics involved in them.

The methodological procedures in this study could, therefore, serve as subsides to the development of nasality writing assessment tools as early as in preschool. As we could observe, these procedures contemplate a very significant number of occurrences, the distribution of these occurrences in different parts of the syllable, in vocabulary accessible to children, spread in pedagogical proposals previously worked with the children.

ACKNOWLEDGEMENT

We thank Dr. Larissa Cristina Berti for her attentive reading and argumentation of several aspects in this article. We also thank the National Board of Scientific and Technologic Development (CNPq, Brazil) for the financial support given to the development of this research (processes number 400183/2009-9 and 304545/2009-0).

RESUMO

Objetivo: Verificar como crianças na série final da educação infantil registram a nasalidade em sua escrita, observando esses registros em função das posições silábicas de ataque e coda e também em função das classes fonológicas envolvidas nos casos de substituições. **Métodos:** O material utilizado foi proveniente de atividade escrita realizada com 19 crianças matriculadas no nível Pré-III da educação infantil. Realizou-se um jogo de adivinhação, no qual elas deveriam escrever o nome de 24 frutas. Dessas, 15 possuíam contexto de nasalidade. A análise teve como parâmetro principal a posição silábica dos grafemas nasais. **Resultados:** A maioria das crianças registrou a nasalidade na escrita, sendo a quantidade de registro maior na posição de ataque silábico. No ataque, houve maior número de registros convencionais enquanto que na coda prevaleceram registros não-convencionais. As substituições ocorreram preferencialmente entre grafemas que remetiam à classe das sonorantes. **Conclusão:** É alta a relevância dos constituintes da sílaba para a caracterização dos pontos de menor e de maior dificuldade da aquisição da escrita da nasalidade. É também relevante o resgate que as crianças fazem de características fonético-fonológicas semelhantes entre os grafemas nasais que elas substituem e aqueles pelos quais são substituídos.

Descritores: Escrita manual; Linguagem infantil; Aprendizagem; Educação infantil; Desenvolvimento da linguagem

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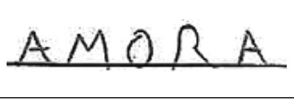
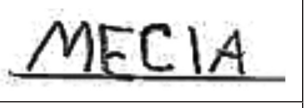
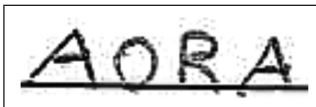
Appendix 1. Examples of nasality writing and non-writing in onset and coda positions

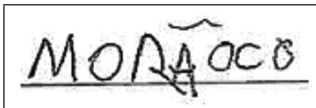
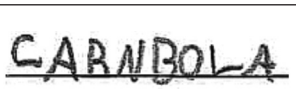
- Nasality writing in the syllabic onset:

	
AMORA PLUM	MELANCIA WATERMELON

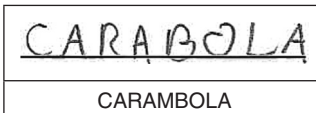
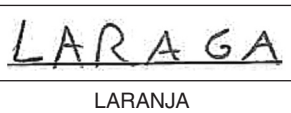
- Nasality non-writing in the syllabic onset:

	
AMORA PLUM	MELANCIA WATERMELON

- Nasality writing in the syllabic coda:

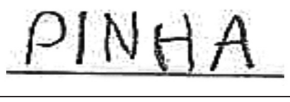
	
MORANGO STRAWBERRY	CARAMBOLA STARFRUIT

- Nasality non-writing in the syllabic coda:

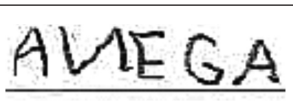
	
CARAMBOLA STARFRUIT	LARANJA ORANGE

Appendix 2. Examples of conventional and non-conventional records of nasality

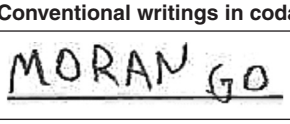
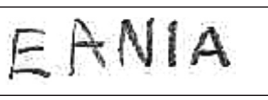
- Conventional writings in onset position:

	
BANANA BANANA	PINHA CUSTARD APPLE

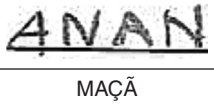
- Non-conventional writings in onset position:

	
MORANGO STRAWBERRY	AMEIXA PLUM

- Conventional writings in coda position:

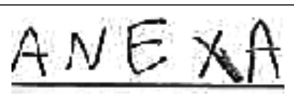
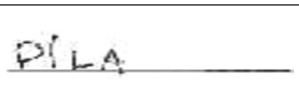
	
MORANGO STRAWBERRY	MELANCIA WATERMELON

- Non-conventional writings in coda position:

	
MAÇÃ APPLE	CARAMBOLA STARFRUIT

Appendix 3. Examples of substitutions in nasality writing using graphemes representing major classes phonemes

- Nasal grapheme substituted for sonorants:

	
AMEIXA PLUM	PINHA CUSTARD APPLE

- Nasal graphemes substituted for obstruents:

	
AMORA BLACKBERRY	MAMÃO PAPAYA