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The Impact of COVID-19 on 'Spanish-Speaking' Children's Phonological Development

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Abstract: Communication and social interaction have been limited during the COVID-19 pandemic. The aim of this study was to check if 3-, 4-, and 5-year-old children manifest alterations in oral language according to their stage of language development. To carry it out, the Induced Phonological Register developed by Monfort and Juárez was applied to analyze 150 participants (77 boys and 73 girls) with an average age of 4 years and 6 months. Children who experienced the COVID-19 pandemic for an extended period show a delay in the acquisition of some phonemes compared to children who undergo typical phonological development as specified by Laura Bosch (2003) regarding language development for Spanish children. Likewise, they present a higher number of erroneous words and phonemes than expected for their age.

Keywords: language; communication; early childhood education; phonological development

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1. Introduction

The COVID-19 pandemic has had a strong impact on the educational community, creating educational difficulties and a notable socio-economic gap [1,2]. Previous research points out the appearance of difficulties such as regressions in developmental stages, difficulties in concentration, and even mild delays in cognitive development, sleep disorders, night terrors, anxiety, irritability, disruptive behaviors, sadness, and fear [3–9].

Additionally, communication, interaction, and relationships have been impacted, as well as emotion recognition. This is due to reduced opportunities for social interaction, diminished social environments and groups, the absence of role models, and the use of masks [10–13]. Thus, the impact of protective measures such as face masks needs to be clarified.

On the one hand, Blazhenkova's study [11] examined the effects of facial mask designs on emotion recognition. Consistent with previous research, the masks generally impaired emotion recognition, reducing phonological accuracy, oral expression, and comprehension [11]. In particular, individual attitudes toward the masks influenced emotion recognition, and negative attitudes correlated with lower phonological accuracy [11].

On the other hand, one study examined how face masks affect the perception of facial features and emotional expressions among signers compared to hearing individuals [12]. The results indicated that masks significantly reduce the perceived valence and age accuracy, especially affecting signers due to their reliance on facial cues for linguistic information via sign language [12]. Masks obstruct crucial visual information, hindering both emotional recognition and communicative effectiveness [12].

In the opposite direction, other research indicates conflicting results. In relation to cognitive development and face mask use among children, a pioneering study evaluated the effect of face masks on cognitive performance and concentration in a real-life school setting [13]. The results showed no significant differences in cognitive performance between the two groups, although there was a slight trend towards poorer performance among those who wore face masks. The short-term intervention in the cited study focused solely on cognitive function, highlighting the need for more comprehensive studies addressing these aspects [13].

The importance of the integration of visual and auditory input in speech perception is explained by the McGurk effect [14]. It demonstrates how vision strongly influences our auditory pickup. A good example is using articulatory reinforcement to better grasp meaning when listening to speech in a foreign language [15,16].

When children acquire a native language, lip movements are a key aid to language acquisition. From a young age, they are sensitive to the movement of the mouth and lips [17]. In this sense, the use of masks has significantly affected nonverbal communication and also speech intelligibility, i.e., the perceived quality of sound transmission [18]. Likewise, it has also affected children who may present difficulties in phonatory articulation, presenting problems differentiating between very similar phonemes [15,19].

Language acquisition follows developmental patterns. In this sense, the stages of the phonetic–phonological component present a very well-defined order of appearance [20], although there is diversity within this order [15]. In general, we can state that the phonological component of Spanish is acquired by children between the ages of 2 years old (the language explosion period), 4 years old (the period of overcoming phonological simplification processes (P.S.F.)), and 6 years old (when the acquisition of the phonetic–phonological repertoire is completed) [21,22].

The authors of [23] point out that the acquisition of phonemes begins very early. Moreover, researchers distinguish between two main levels based on the organization of sounds in utterances: the prelinguistic level, which involves sounds in pre-words, and the linguistic level, which encompasses sounds in words and phrases. However, authors such as Ingram [24], Gallardo-Ruiz and Gallego-Ortega [25], and Li et al. [26] agree on dividing phonetic–phonological acquisition into four periods spanning from birth to seven years of age. Depending on the developmental characteristics, the evolution of the phonological component could be summarized in four stages [27,28].

Typical Phonological Development among Spanish Children

The first stage corresponds to the prelinguistic period (birth—1 year of life), involving involuntary production until the stage of conversational babbling interpreted by the adult. Thus, according to Aguilar [29] and Leonard [22], their phonoarticulatory structure (the tongue, the upper lip, the lower lip, the upper teeth, the upper gum ridge, the hard palate, the velum, the uvula, the pharyngeal wall, and the glottis) will provide children with the basis to show their first motor speech patterns (see Table 1).

During the second stage, phonological development spans from 12 to 18 months and begins with the phonological stage of Jakobson's consonantism. This stage involves the phonology of the first 50 words, which are characterized by the use of bilabial and alveolar consonants. Children preferentially produce occlusive sounds such as /p/, /t/, and /k/ or nasal sounds such as /m/, /n/, and /ñ/, as well as vowel sounds like /a/, /u/, and /i/ [30,31] (see Table 1).

The next stage (3) covers the period from 18 months to 4 years and includes processes of speech simplification, language explosion, and the expansion of the phonetic repertoire. At four years of age, children have practically overcome the limitations in some consonant groups [22,31,32]. They show target pronunciation of vowels and nasal and plosive phonemes, although omissions or phoneme substitutions may occur. More specifically, for 3-year-old children, significant milestones in phonological development include the ability to produce a variety of consonant and vowel sounds, although they may still have difficulty with some more complex sounds. At this age, children typically master simpler sounds such as /p/, /m/, /h/, /n/, /w/, and /b/ (see Table 1). They begin to form more complex sounds like /k/, /g/, /d/, /t/, and /ŋ/ (as in "sing") (see Table 1). Speech at this stage is often intelligible to family members, though unfamiliar listeners may still find it difficult to understand. Additionally, 3-year-olds start to use basic intonation patterns and stress, which are essential for communication.

As Bosch explains [33], the last stage, from 4 to 6 years of age, culminates with the acquisition of the phonetic repertoire and phonological development, so, subsequently, speech is intelligible, residual non-target forms have been reduced, and the pronunciation of some later phonemes such as /ll/ has improved [22,31]. The later acquisitions are not yet complete at age 4, although the essentials have been acquired for most children. Phonemes of greater articulatory difficulty have not yet been acquired or need refinement; these include phonemes such as fricatives, vibrants, or laterals. These developmental milestones highlight the significant progress in phonological development that occurs between the ages of 4 and 5, marking a crucial period for acquiring clear and accurate speech patterns among Spanish-speaking children. More specifically, for 4-year-old children, significant milestones in phonological development include acquiring the ability to accurately articulate most consonant and vowel sounds. They typically master simpler sounds such as /p/, /m/, /h/, /n/, /w/, and /b/ (see Table 1). Additionally, they begin to produce more complex sounds like /k/, /g/, /d/, /t/, and /ŋ/ (as in "sing") (see Table 1). They also start to use proper intonation and stress patterns, which are crucial for effective communication. At this age, children can usually be understood by both familiar and unfamiliar listeners, although they might still struggle with some multisyllabic words and complex consonant groups. By the age of 5, children's phonological abilities become more refined. They typically have a better grasp of complex consonant groups and can produce sounds like /s/, /z/, /v/, and /ʃ/ (as in "shoe") more accurately (see Table 1). Their ability to differentiate and produce different sounds in various word positions (initial, medial, final) also improves. Additionally, 5-year-olds can recognize and correct some of their own non-target forms of speech, showing increased phonological awareness. They also develop a more sophisticated understanding of rhyming and alliteration, which are important for early literacy skills. By this age, their speech is mostly intelligible to adults, with only occasional non-target forms in pronunciation.

In this regard, Monfort and Juárez [20] (p. 20) say that "the development of the child's phonological competence should be considered as a progressive adaptation of his/her aptitudes to make sounds that are more and more subtly opposed, according to the models of the language of his/her environment". Regarding phonological development, it is necessary to highlight Jackobson and Waugh's [34] law of maximum contrast, which consists of acquiring a phoneme once a previous one has been acquired, except for the first-ever acquisition. Each new phoneme modifies the whole system. Once children have acquired some phonemes, they begin to exhibit phenomena typical of infant speech such as simplifications, phoneme substitutions, and assimilations [35].

Research on the phonological development of the Spanish language shows consistency. The research carried out by Bosch [30], starting with the study in 1983 and the publication of its results in 2003, shows that the acquisition of phonemes is enriched as a child advances in age, so she proposes that at 3 years of age, a child should have acquired /m/, /n/, /p/, /u/, /k/, /b/, /g/, /f/, /nasal + C/, and decreasing diphthongs (see Table 1). At 4 years of age, a child should have acquired all of the above plus /d/, /r/, and the affricate /ch/ (see Table 1). By the age of 5, /s+C/ and /C+r/ are added (see Table 1). Fricatives such as /f/, /s/, /z/, and /j/ (see Table 1) are acquired between 5 and 6 years of age. Finally, at 6 years of age, the last to be acquired are the lateral and vibrant phonemes such as Ir/ /s+CC/, /liquid+ C/, and rising diphthongs [23] (see Table 1). These results are consistent with the research by Aguilar [29] and Leonard [22], who found similar results to those reported by Bosch [30,36] and Narbona [37] regarding phonetic–phonological acquisition. In this sense, it is necessary to clarify that Spanish authors discussing the evolutionary development of phoneme acquisition, such as Bosch [30,36], Narbona [37], and Monfort and Juárez [20], are key in this study. They state which phonemes should be acquired at what age, or what percentage of children should reach each milestone.

In addition, we should keep in mind that the diversity of non-target forms is limited. The most common are phoneme omissions and exchanges [32,38], while non-target forms such as inversion, distortion, and insertion are scarce.

Table 1. Percentages of subjects correctly articulating various phonemes and phoneme groups according to chronological age (extracted from Bosch [36]).

		Age				
Articulatory Mode	**Spanish Phonemes**	**3 Years**	**4 Years**	**5 Years**	**6 Years**	**7 Years**
Nasals	/m/	90	100	100	100	100
	/n/	90	100	100	100	100
	/ñ/	90	100	100	100	100
Plosives	/p/	90	100	100	100	100
	/t/	90	100	100	100	100
	/k/	90	100	100	100	100
	/b/	90	100	100	100	100
	/d/	90	90	100	100	100
	/g/	80	90	100	100	100
	/ĉ/	80	90	100	100	100
Fricatives	/f/	80	90	100	100	100
	/s/	80	80	90	100	100
	/θ/	50 or <	70	80	90	100
	/x/	90	100	100	100	100
Liquids	/l/	90	100	100	100	100
	/ll/	60	80	80	80	80
	/r/	70	80	80	80	90
	/rr/	50 or <	70	80	80	90
Diphthongs	Rising diphthongs	90	100	100	100	100
	Decreasing diphthongs	50 or <	70	70	80	90
Groups	nas+c	90	100	100	100	100
	s+cc	50 or <	70	80	90	100
	c+l	50 or <	60	70	90	100
	c+r	60	80	80	80	100
	liq+c	50 or <	70	70	80	90

Moreover, it is noteworthy that gender differences exist among children: girls tend to exhibit earlier linguistic development compared to boys, though this balance equalizes by the beginning of primary school [39]. Garayzábal [40] and Bouchon et al. [41] underscore that girls typically initiate language acquisition earlier than boys due to physiological factors that accelerate brain maturation in girls. Consequently, this earlier maturation enables girls to achieve better control over their articulatory organs [42].

The aim of this research is to assess phonetic–phonological acquisition among children aged 3 to 5 (born between 2017 and 2019) who have experienced the COVID-19 pandemic to determine if they exhibit normotypical phonological development. The instrument "induced phonological register by Monfort and Juárez" was used to determine the state of their phonological development. The results for each age group, 3 years, 4 years, and 5 years of age, are compared with the results for normotypical development described by the instrument "induced phonological register by Monfort and Juárez".

2. Materials and Methods

2.1. The Sample

The sample consisted of N = 150 children (monolingual and Spanish speakers) (77 boys and 73 girls) aged between 3 and 5 with a mean age of 4 years and 6 months. The type of sampling applied was cluster sampling, which was carried out in the autonomous community of Aragon (Spain). These children were born between 2017 and 2019. In other words, they lived between 3 and 1 year of the COVID-19 pandemic and experienced social restrictions.

2.2. The Design and Procedure

Regarding the research design and procedure, data collection was carried out during the month of April 2022 in several phases and in a sequential manner. In phase I, teachers and school management were informed electronically about the purpose of this research and the instrument used for it. This phase was carried out during the month of March. After this, informed consent was collected from the families of the participants during the month of April. In phase II, the phono-articulatory development of the participants was evaluated with the Induced Phonological Register developed by Monfort and Juárez [43] during class time in April. The test was administered individually in the Hearing and Language classrooms of the schools. In phase III, the results were analyzed, and conclusions were drawn. Subsequently, the results of the recordings were shown to each child's tutor, and a brief personal commentary on what was seen during the test was also provided. Finally, in phase IV, the participants were thanked for their attitudes and participation in this study.

The procedure and subsequent data processing were conducted in accordance with the ethical principles established in the Declaration of Helsinki of the World Medical Association (WMA). Readers can review the ethics statement and annex sections to find the application forms for centers and families.

2.3. The Instrument

The induced phonological register [44] developed by Monfort and Juárez was used. This instrument is intended for children between the ages of 3 and 7 years old. It is used to assess phonological development, induced speech, and repetition through the use of flashcards that review the fundamental phonological repertoire in Spanish.

Instruments for measuring phonological development in Spanish (the dominant language spoken in the nation of Spain) are scarce. The induced phonological register is one of the most widely used tests in clinical and research contexts because it provides an objective assessment of phonological performance among children. It requires verbal responses but not reading.

In this study's construction, gender (boys, girls), age (3, 4, 5, 6, and 7), and sociocultural situation were taken into account, selecting different environments. Thus, a total population of 516 children was used for the evaluation. It is necessary to point out that children with difficulties in the articulatory apparatus, hearing impairment, motor impairments, or diagnosed psychic deficiencies were excluded. In other words, this instrument is based on the normotypical development of pupils without any difficulties that could affect language [44].

Therefore, we used it to record the characteristics of a child's speech from a qualitative point of view, i.e., in terms of induced production of words and repetition, if necessary. In this way, a child has two opportunities to pronounce a word accurately.

It helped us determine which phonemes were not articulated in spontaneous speech and what articulatory non-target forms were created.

At the end of the test, an isolated repetition of the erroneous phonemes in terms of syllables and an exploration of orofacial praxis, voice, rhythm, and behavior were performed. The instrument offers the percentage of each type of error distributed by age, among which we distinguish substitution, omission, distortion, inversion, and insertion.

2.4. Instructions for Use

The main objective of this instrument is to collect information on all the phonemes that make up the sound inventory. This procedure involves naming drawings to elicit isolated words from the participant. The test consists of 57 picture-naming tasks involving drawings and evaluates the articulation of specific phonemes, offering scales based on the number of words and phonemes missed.

Each child observed a drawing in the picture-naming task and told us the name of the word represented in the drawing, allowing us to identify phonemes that are not articulated accurately, as well as any omissions, substitutions, and inversions. The results were stored on a record sheet that shows whether the child had said the word accurately or, in case they had not, what he/she articulated and if he/she needed us to say the word in order to repeat it and, given the word model, if the child was able to repeat it accurately or made the same mistakes.

The test provides a recording sheet on which the evaluator (who was always the same person for all cases and had previous experience and training in speech therapy) noted how the child said a word. Each child had two chances to pronounce the word accurately. The results of both were recorded.

In the Induced Phonological Register [44] developed by Monfort and Juárez, the examiner calculates both the number of words accurately produced by a child and the number of accurately articulated phonemes. This involves the following steps:

- Counting target words—The examiner tallies the total number of words that the child pronounces accurately, without any phonological non-target forms. This count provides a measure of the child's overall word production accuracy.
- Counting target phonemes—The examiner also counts the total number of phonemes that the child articulates accurately within the words. Each phoneme is analyzed individually to determine whether it has been produced accurately according to standard phonological rules.

These calculations help in assessing a child's phonological development more precisely, allowing for a detailed understanding of both word-level and phoneme-level proficiency.

3. Results

In this section, we will report the counts of target and non-target forms across the three groups of children and compare their performance against expected norms for typical phonological development. First, it is necessary to highlight the absence of significant differences in the number of words ($F = 0.17$; $p = 0.83$) and non-target phonemes ($F = 0.01$, $p = 0.98$), where the development of children of 3, 4, and 5 years of age is equivalent (see Table 2). In this sense, the development of 3-year-old children (who lived through one year of the COVID-19 pandemic) is similar to children's development as described by Monfort and Júarez [44] and is even above average, while the development of 4-year-old children (who lived through two years of the COVID-19 pandemic) is slightly below average—without exhibiting a significant delay.

Table 2. Sociodemographic data.

Age	Total N	N Boys	N Girls
3 years	50	29	21
4 years	50	24	26
5 years	50	24	26

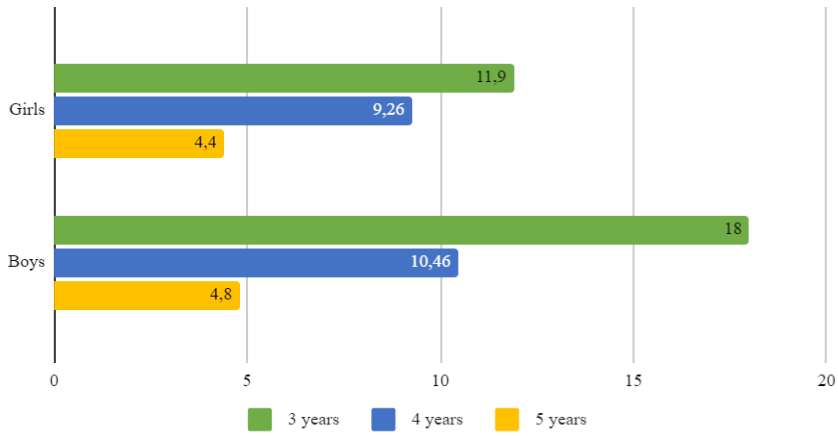
However, 5-year-old children (both boys and girls) exhibited severe difficulties with non-target words (boys $M = 10.46$, $SD = 9.66$; girls $M = 9.26$, $SD = 9.34$) compared to the normotypical scores (boys $M = 4.8$, $SD = 7.19$; girls $M = 4.4$, $SD = 6.16$) as found by Monfort and Juárez via the "induced phonological register" [44] they developed. That is to say, the children in our study present a level of phonetic–phonological development below the average expected for their age and mother tongue. Thus, although the same picture-naming tasks were presented to 3-year-old, 4-year-old, and 5-year-old children, we found that 5-year-old children presented more non-target forms than their younger peers. Thus, there is evidence of a delay in the phonological development of 5-year-old children.

In fact, there is a moderate relationship between age and the total number of not-targeted words ($r = 0.27$, $p < 0.001$). This indicates that as children age, the types of errors they make show a small but statistically significant change. Although the correlation coefficient is low, suggesting the relationship is not strong, the *p*-value indicates that the observed relationship is unlikely to be due to chance. Similarly, severe difficulties were found in the number of non-target phonemes (boys: M = 17.66, SD = 11.37; girls: M = 12.57, SD = 7.00) compared to normotypical scores (boys: M = 5.05, SD = 7.34; girls: M = 5.35, SD = 8.34). On the other hand, Student's t-tests revealed no gender differences in the total number of non-target words (t = 1.08, df = 109, p = 0.27) and the total number of non-target phonemes (t = 0.98, df = 76, p = 0.327) in the studied population (see Figure 1), a result that contrasts with normotypical development.

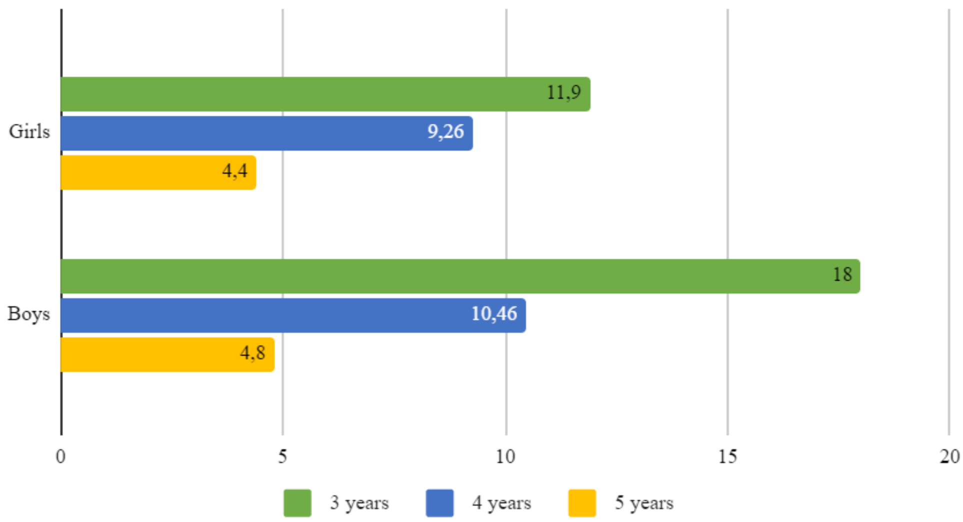
However, the study sample exhibits not only an evident delay in the number of phonemes but also a high number of erroneous words. If each phoneme is analyzed and compared with the acquisition of the Bosch phonemes, we find that the acquisition of these phonemes by children aged 4 (born in 2018) and 5 (born in 2019) is at lower levels than expected for their age.

Total number of non-target words

(**a**)



(**b**)



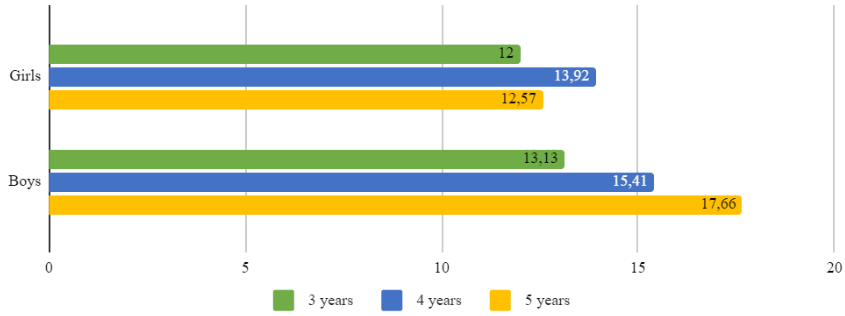
Student's t-test (t = 1.08, df = 109, p = 0.27) (gender differences)

ANOVA (gender differences)

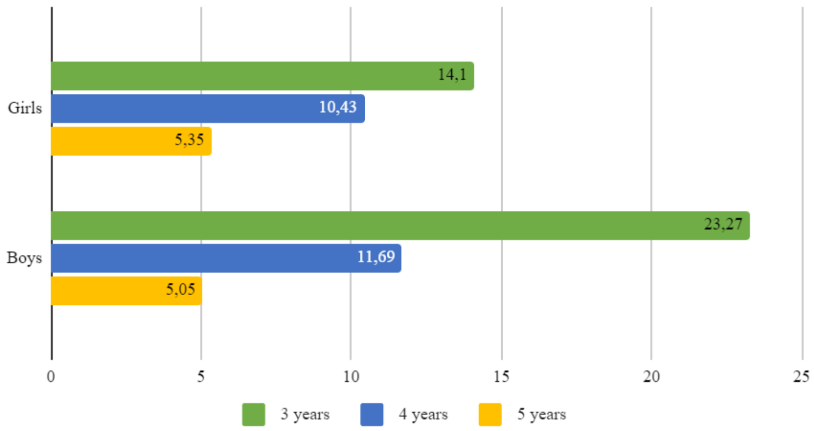
F = 0.17, p = 0.83

Figure 1. *Cont.*

(**c**)



(**d**)



Student's t-test (t = 0.98, df = 76, p = 0.32) (gender differences)

ANOVA ((gender differences)

F = 0.01, p = 0.98

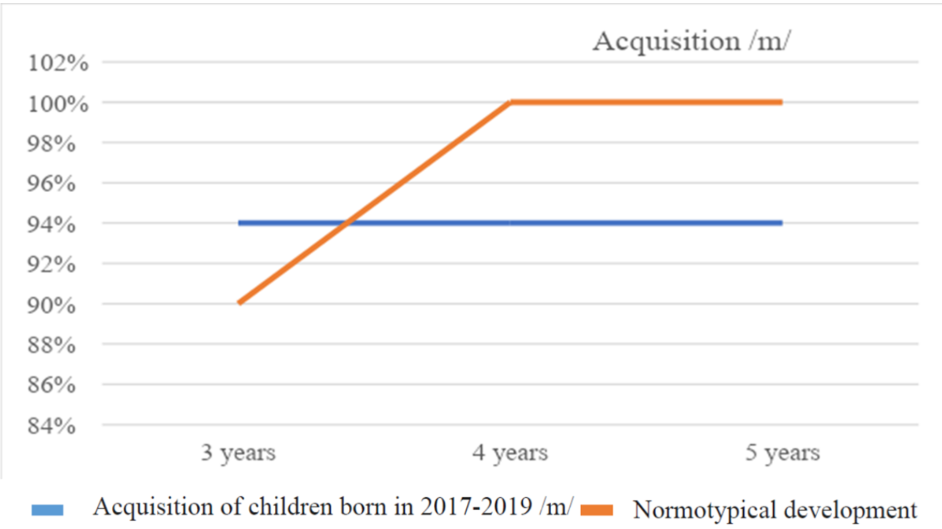
Figure 1. Descriptive tables of total non-target words and phonemes among children born between 2017 and 2019 and psycho-linguistic evolutionary development between genders. (**a**) Total number of non-target words. (**b**) Normotypical development according to Monfort and Juárez Sánchez. (**c**) Total number of non-target phonemes (for children born from 2017 to 2019). (**d**) Total number of incorrect phonemes. Normotypical development according to Monfort and Juárez Sánchez.

There are no significant differences in the level of proficiency shown by children in terms of the pronunciation of /m/, /n/, and /ñ/ (see Figure 2).

Similarly, a generalized delay in the acquisition of the occlusives /p/, /t/, /k/, /b/, /d/, and /g/ was inferred (see Figure 3) as there are no significant differences that could be found. Thus, 4- and 5-year-olds born between 2017 and 2019 present a lower-than-expected proficiency level, with the exception of the acquisition of the phoneme /d/ at the age of 4, for which the level corresponds to normo-typical development.

What is most significant is the acquisition of liquids, wherein the sample of 4- and 5-year-olds presented severe difficulties compared to the expected level of development (see Figure 3). More specifically, the case of /r/ is noteworthy, as significant differences were found between ages. Specifically, 3-year-old children showed greater acquisition of these phonemes compared to their 4- and 5-year-old counterparts (see Figure 4). In this sense, in regard to the acquisition of the phoneme /r/, it is expected that 80% have acquired it at 4 and 5 years of age; however, in our sample, only 36% acquired it at 4, and 46% acquired this phoneme at 5 years old. The differences between our study sample and normo-typical children indicated very delayed development at 4 and 5 years of age in terms of the acquisition of /r/ in the sample (valueXi, 10.72, $p < 0.01$). In addition, significant differences were found between gender, with boys presenting greater difficulties (t = 2.48, df = 148; $p = 0.01$). A similar pattern was found with the phoneme /rr/ at 4 and 5 years of age, when 70% of children should have acquired it. However, we found that it was only acquired by 34% of 4-year-olds and 24% of 5-year-olds. In other words, the acquisition of /rr/ by 4- and 5-year-olds is similar to the development of 3-year-olds. With regard to the phoneme /l/, we found a lower level of competence than expected for their age, constituting an opposite result with respect to the acquisition of the phoneme /ll/, where we not only found a competence slightly above the average but also differences between genders, with boys having greater difficulties (t = 2.36, df = 148; $p = 0.01$).

(**a**) Acquisition of /m/



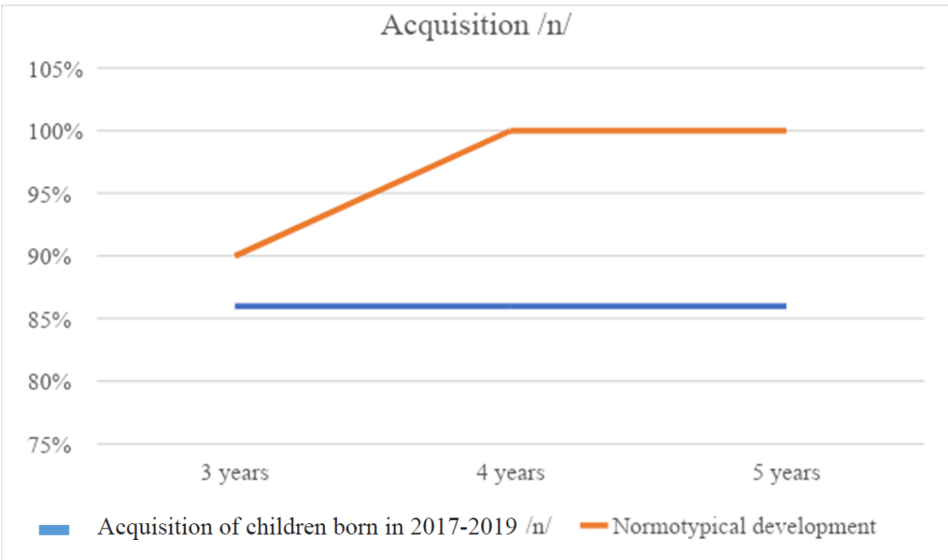
Chi-Squared Test (age)

Value = 3.59, df = 2, $p = 0.16$

Student's t-test (gender)

T = −1.06; df = 148; $p = 0.28$

(**b**) Acquisition of /n/.



Chi-Squared Test (age)

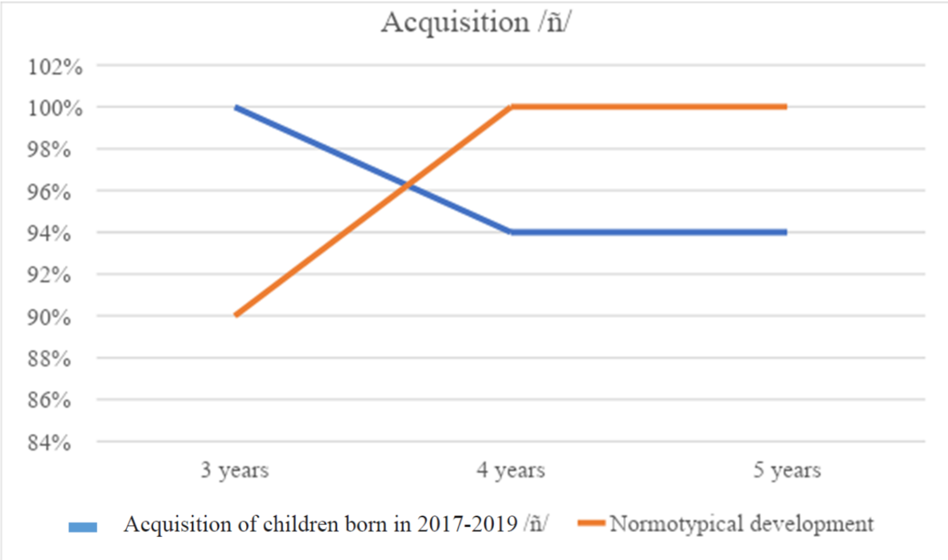
Value = 0.92, df = 2, $p = 0.62$

Student's t-test (gender)

T = −1.16; df = 148; $p = 0.24$

Figure 2. *Cont.*

(**c**) Acquisition of /ñ/.



Chi-Squared Test (age)

Value = 3.12, df = 2, p = 0.21

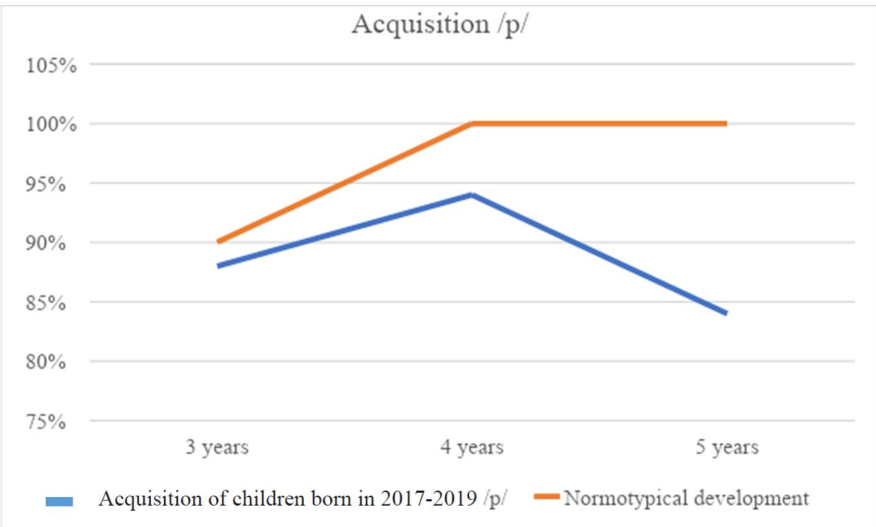
Student's t-test (gender)

T = −0.89; df = 148; p = 0.37

Figure 2. Acquisition of nasals by children born from 2017 to 2019 vs. normo-typical development according to Bosch.

In the case of fricatives, there is a greater heterogeneity of results. Initially, the population sample presents a normo-typical development, and even an advanced one for the phonemes /θ/ and /s/. This is not the case for the phoneme /f/, which presents a relevant delay in the sample of 3-, 4-, and 5-year-olds compared to what is expected for its normo-typical development. In this sense, the linguistic development of this study sample shows a similar acquisition. In addition, significant differences were found with respect to gender and the proficiency level for /θ/ and /f/, with boys presenting a greater number of difficulties (see Figure 5).

(**a**) Acquisition of /p/.



Chi-Squared Test (age)

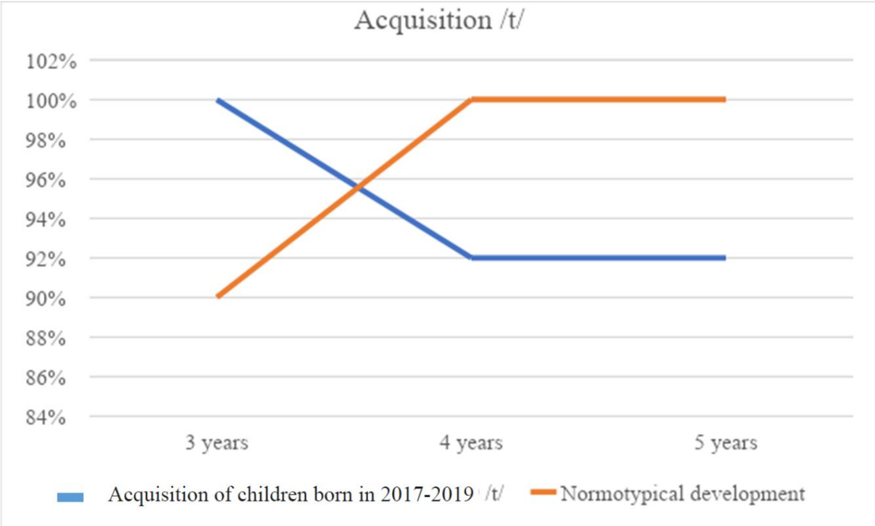
Value = 2.25, df = 2, p = 0.28

Student's t-test (gender)

T = 2.24; df = 148; p = 0.02

Figure 3. *Cont.*

(**b**) Acquisition of /t/.



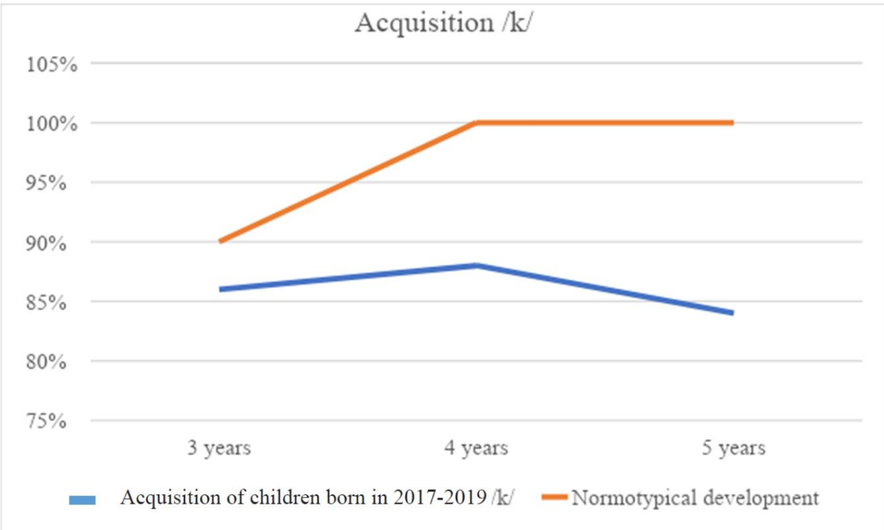
Chi-Squared Test (age)

Value = 4.22, df = 2, p = 0.12

Student's t-test (gender)

T = 1.36; df = 148; p = 0.17

(**c**) Acquisition of /k/.



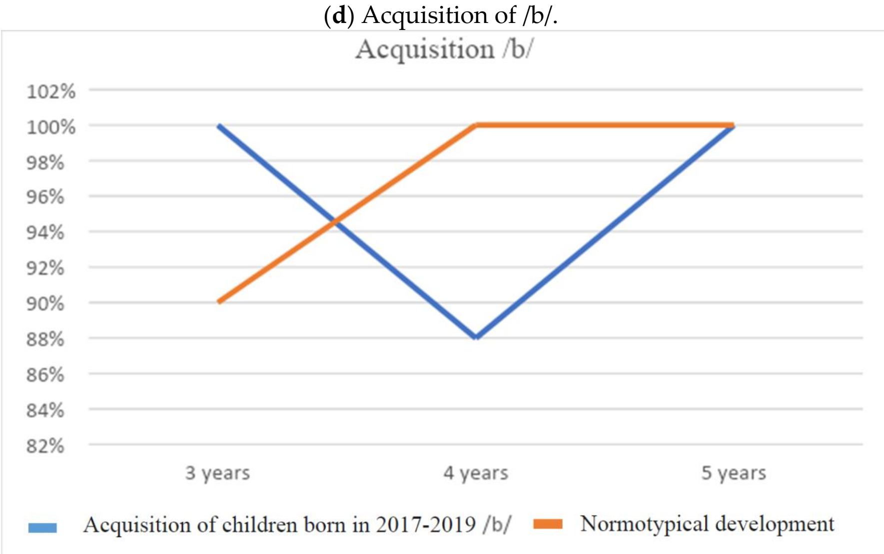
Chi-Squared Test (age)

Value = 0.33, df = 2, p = 0.87

Student's t-test (gender)

T = 3.51; df = 148; p < 0.001

(**d**) Acquisition of /b/.



Chi-Squared Test (age)

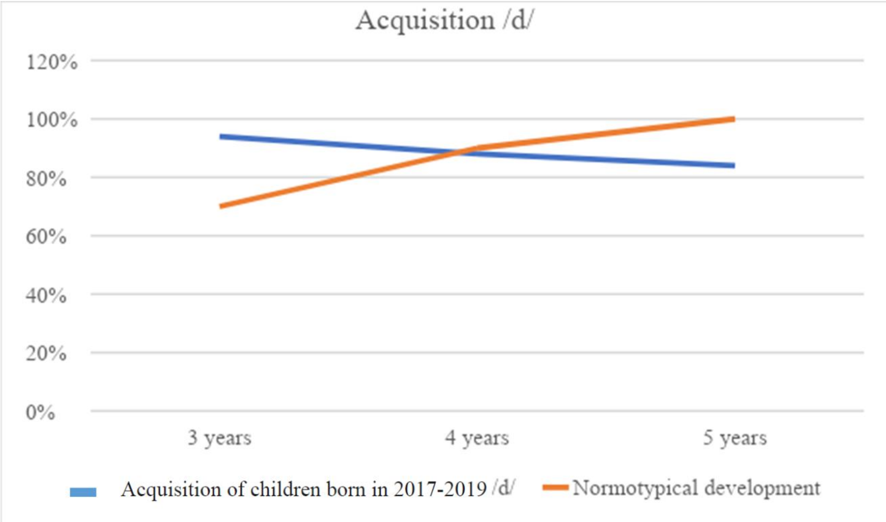
Value = 12.50, df = 2, p = 0.02

Student's t-test (gender)

T = 0.76; df = 148; p = 0.44

Figure 3. *Cont.*

(**e**) Acquisition of /d/.



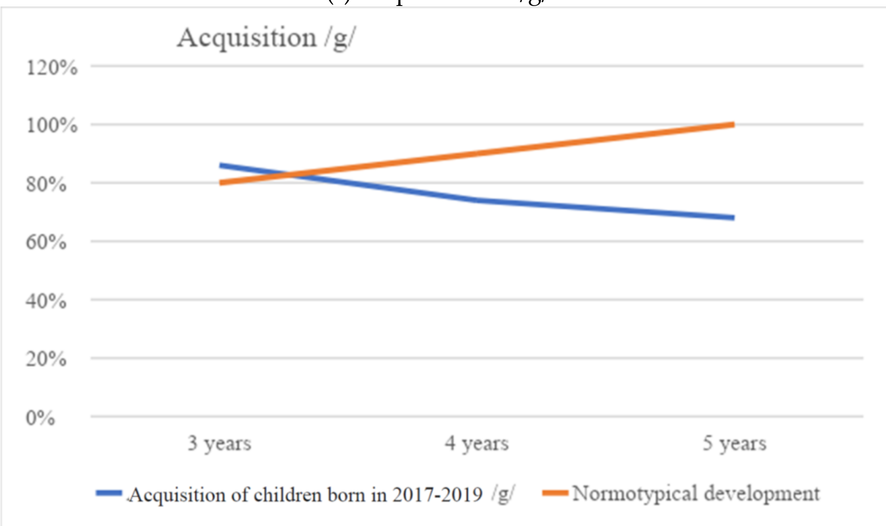
Chi-Squared Test (age)

Value = 2.52; df = 2, $p = 0.28$

Student's t-test (gender)

T = 0.65; df = 148; $p = 0.51$

(**f**) Acquisition of /g/.



Chi-Squared Test (age)

Value = 4.60, df = 2, $p = 0.10$

Student's t-test (gender)

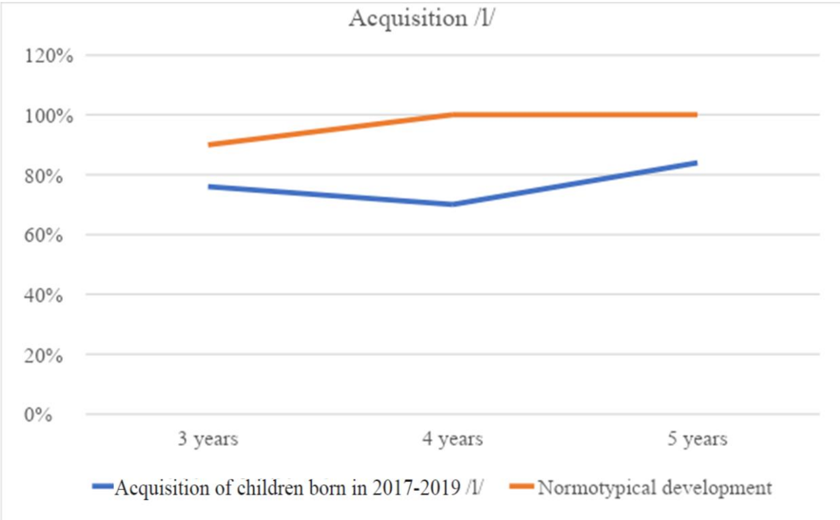
T = 1.34; df = 148; $p = 0.18$

Figure 3. Acquisition of plosives among children born from 2017 to 2019 vs. normo-typical development according to Bosch.

Another element that stands out is undoubtedly the acquisition of rising diphthongs (see Figure 6), where a generalized delay in acquisition is evident, even in the 3-year-old participants. Thus, the level of acquisition for /ia/, /ie/, /io/, and /oa/ is around 40%, while according to evolutionary development, this should be between 90 and 100%.

However, the acquisition of decremental diphthongs (see Figure 7) shows normo-typical and even above-average development.

(**a**) Acquisition of /l/.



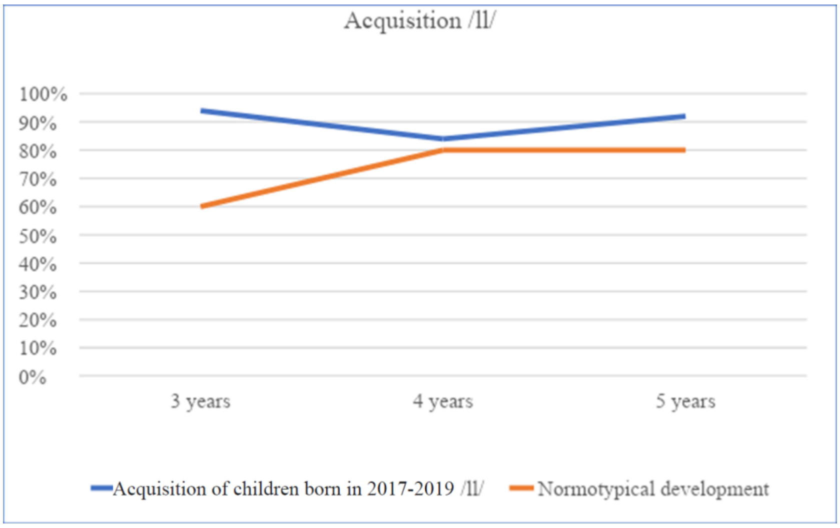
Chi-Squared Test (age)

Value = 2.78, df = 2, p = 0.25

Student's t-test (gender)

T = 0.01; df = 148; p = 0.99

(**b**) Acquisition of /ll/.



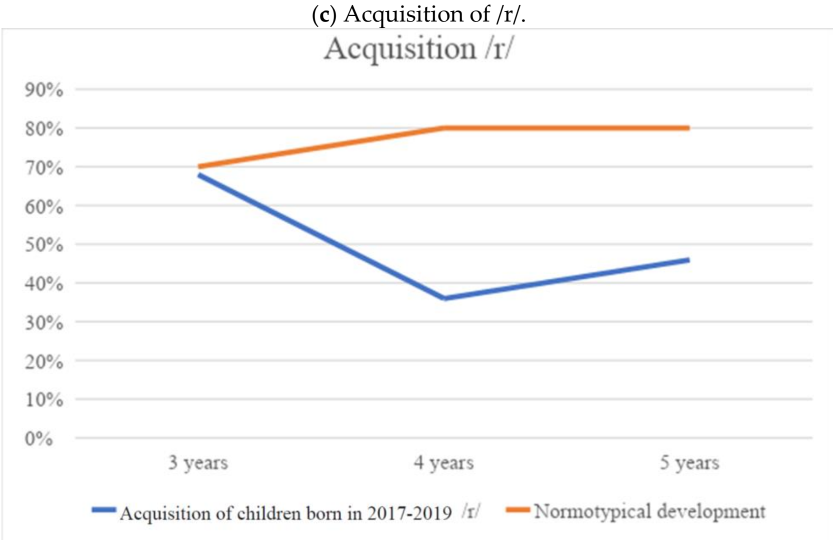
Chi-Squared Test (age)

Value = 3.11, df = 2, p = 0.21

Student's t-test (gender)

T = 2.36; df = 148; p = 0.01

(**c**) Acquisition of /r/.



Chi-Squared Test (age)

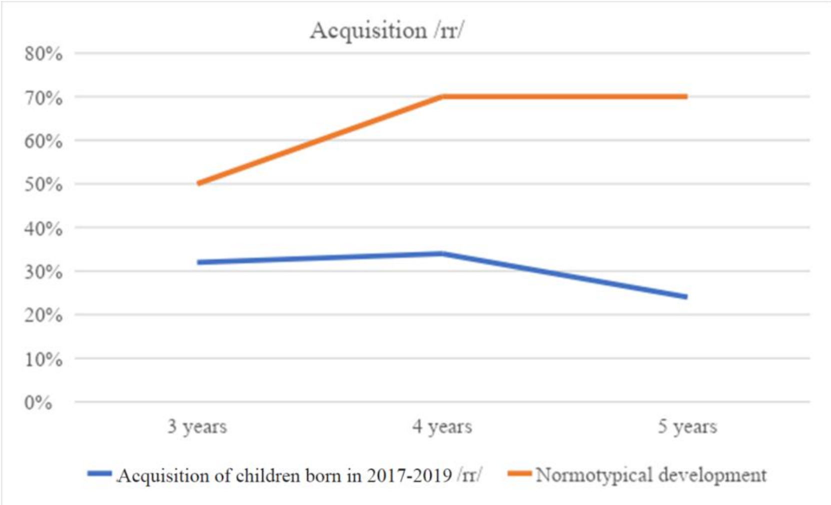
Value = 10.72, df = 2, p = <0.01

Student's t-test (gender)

T = 2.48; df = 148; p = 0.01

Figure 4. *Cont*.

(**d**) Acquisition of /rr/.



Chi-Squared Test (age)

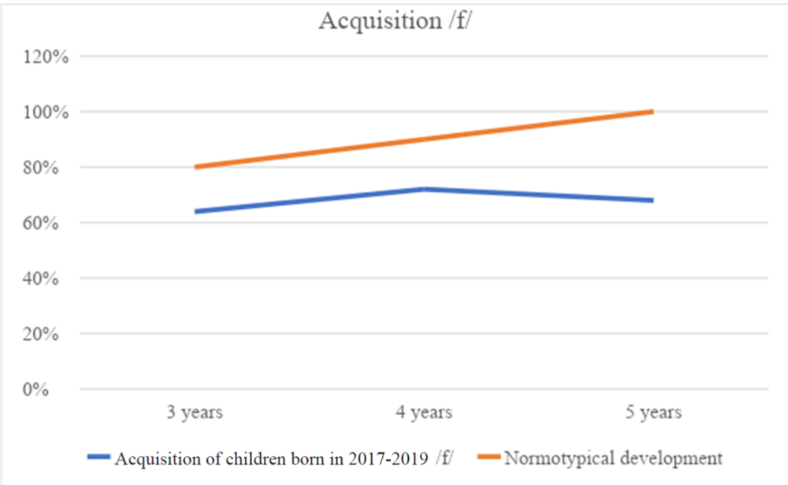
Value = 1.33, df = 2, p = 0.51

Student's t-test (gender)

T = 1.82; df = 148; p = 0.07

Figure 4. Acquisition of liquids in children born from 2017 to 2019 vs. normo-typical development according to Bosch.

(**a**) Acquisition of /f/.



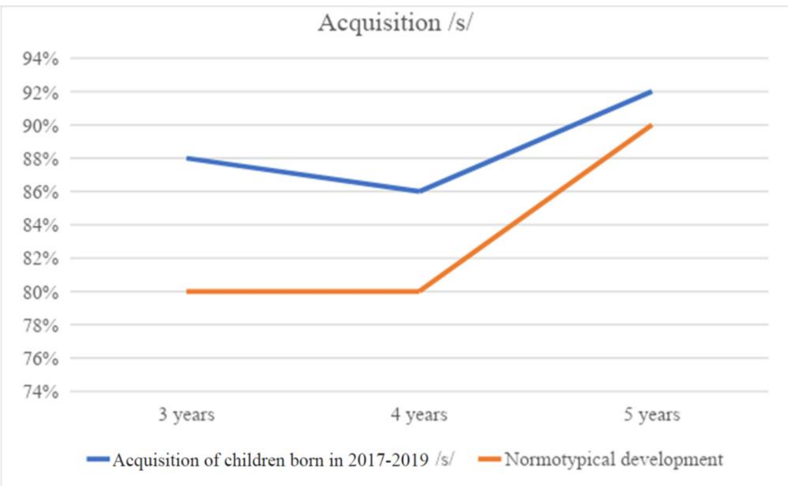
Chi-Squared Test (age)

Value = 0.73, df = 2, p = 0.69

Student's t-test (gender)

T = 3.77; df = 148; p = <0.001

(**b**) Acquisition of /s/.



Chi-Squared Test (age)

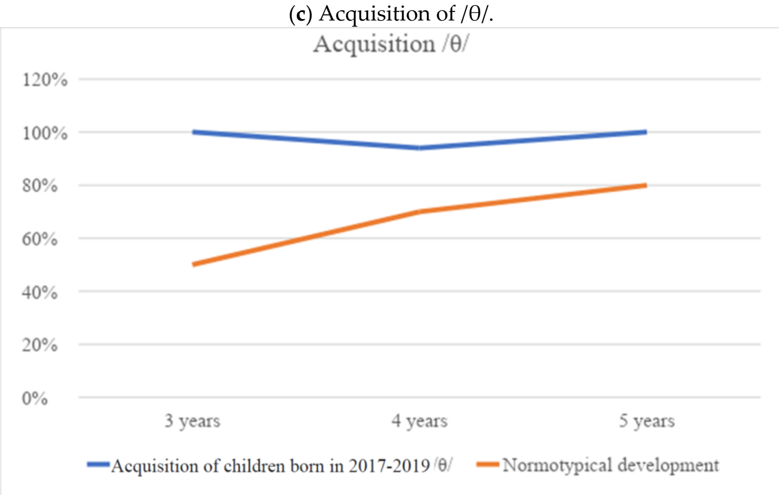
Value = 0.92, df = 2, p = 0.62

Student's t-test (gender)

T = 1.16; df = 148; p = 0.24

Figure 5. *Cont.*

(**c**) Acquisition of /θ/.



Chi-Squared Test (age)

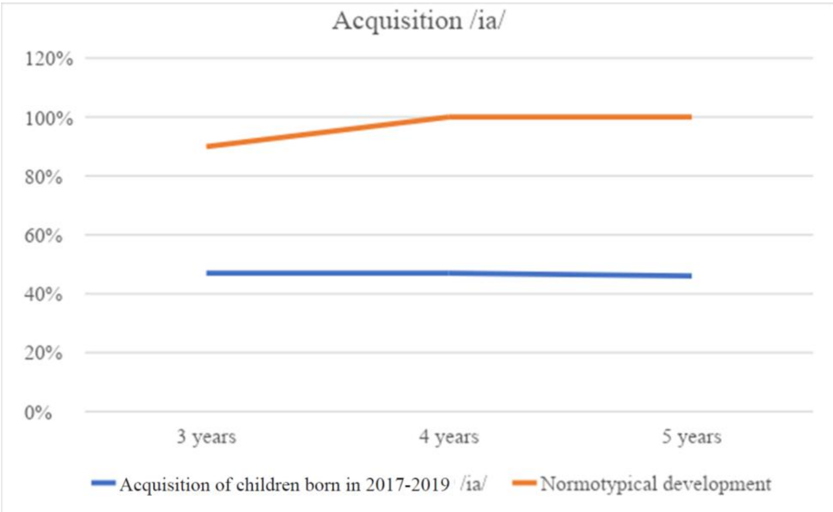
Value = 6.122, df = 2, p = 0.04

Student's t-test (gender)

T = 0.53; df = 148; p = 0.59

Figure 5. Acquisition of fricatives among children born from 2017 to 2019 vs. normo-typical development according to Bosch.

(**a**) Acquisition of /ia/



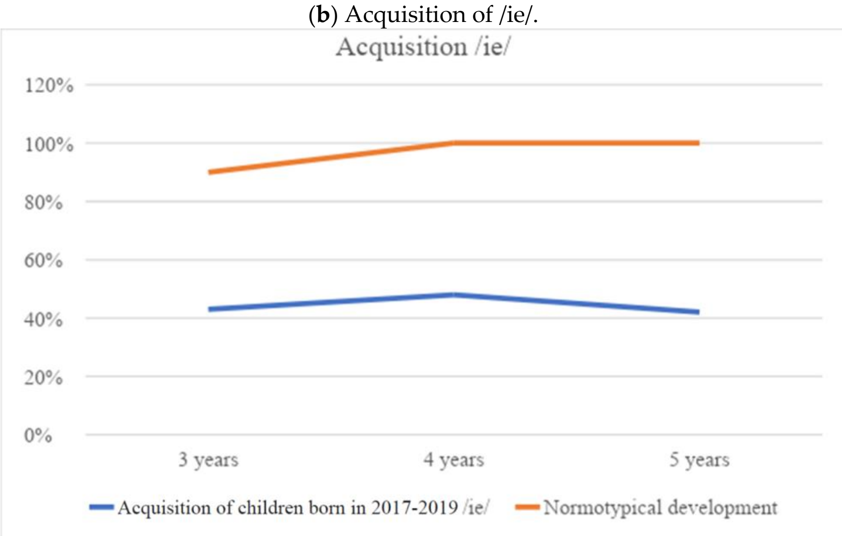
Chi-Squared Test (age)

Value = 0.21, df = 2, p = 0.89

Student's t-test (gender)

T = 0.56; df = 148; p = 0.57

(**b**) Acquisition of /ie/.



Chi-Squared Test (age)

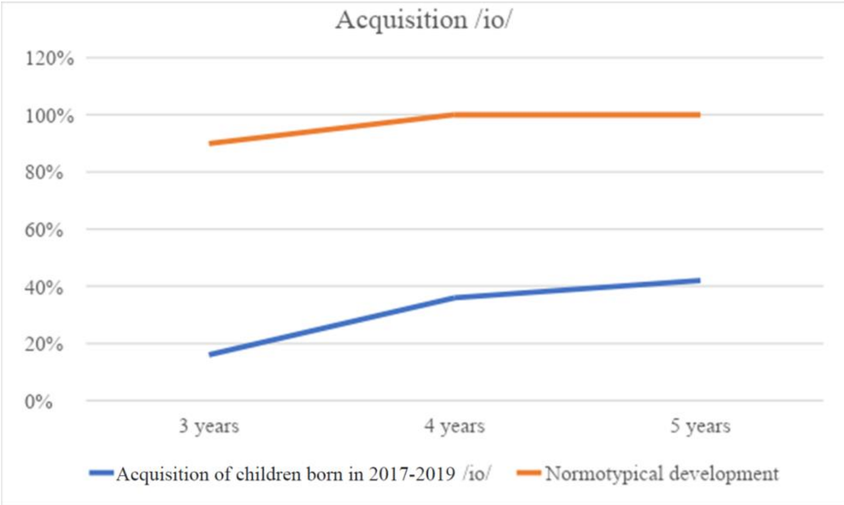
Value = 4.11, df = 2, p = 0.12

Student's t-test (gender)

T = −0.37; df = 148; p = 0.71

Figure 6. *Cont*.

(**c**) Acquisition of /io/.



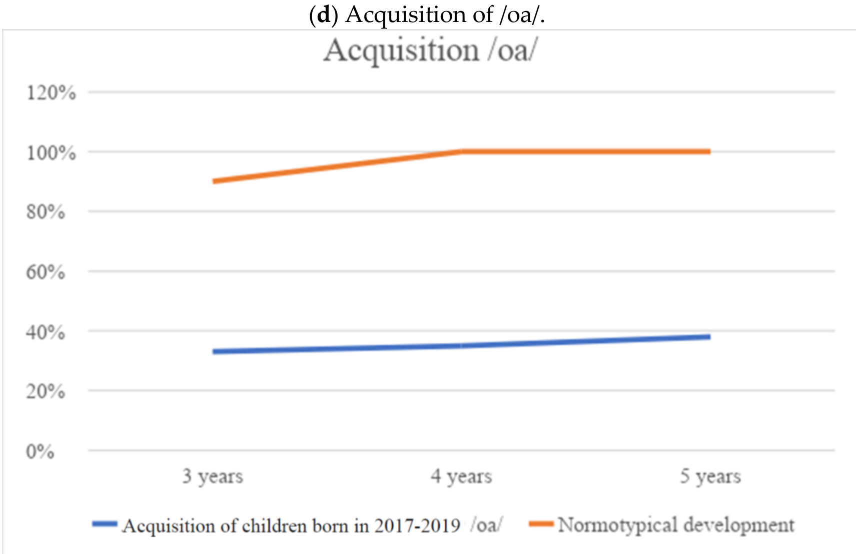
Chi-Squared Test (age)

Value = 31.68, df = 2, p < 0.001

Student's t-test (gender)

T = 1.09; df = 148; p = 0.27

(**d**) Acquisition of /oa/.



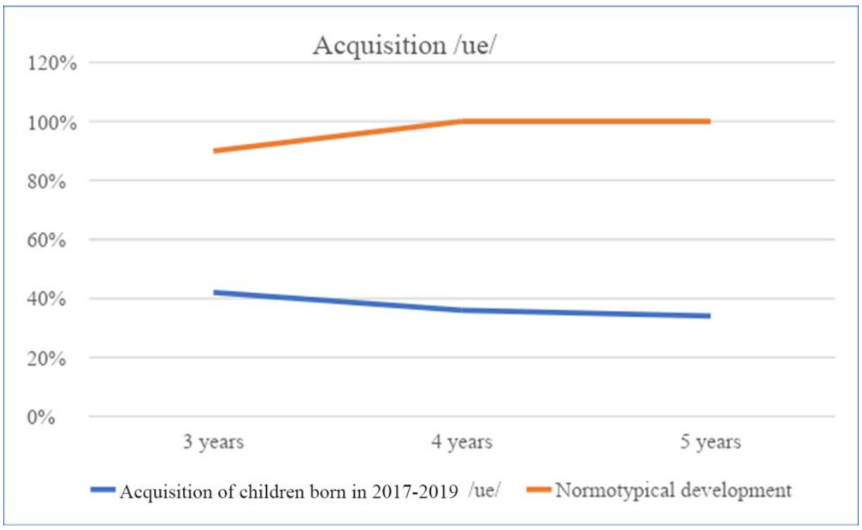
Chi-Squared Test (age)

Value = 1.22, df = 2, p = 0.54

Student's t-test (gender)

T = 0.86; df = 148; p = 0.39

(**e**) Acquisition of /ue/.



Chi-Squared Test (age)

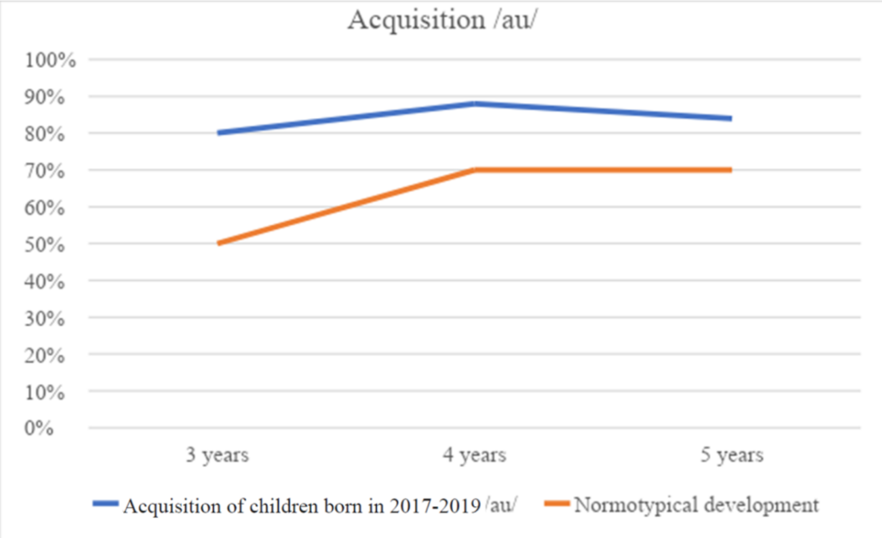
Value = 3.66, df = 2, p = 0.16

Student's t-test (gender)

T = 0.18; df = 148; p = 0.85

Figure 6. Acquisition of rising diphthongs among children born from 2017 to 2019 vs. normo-typical development according to Bosch.

(**a**) Acquisition of /au/.



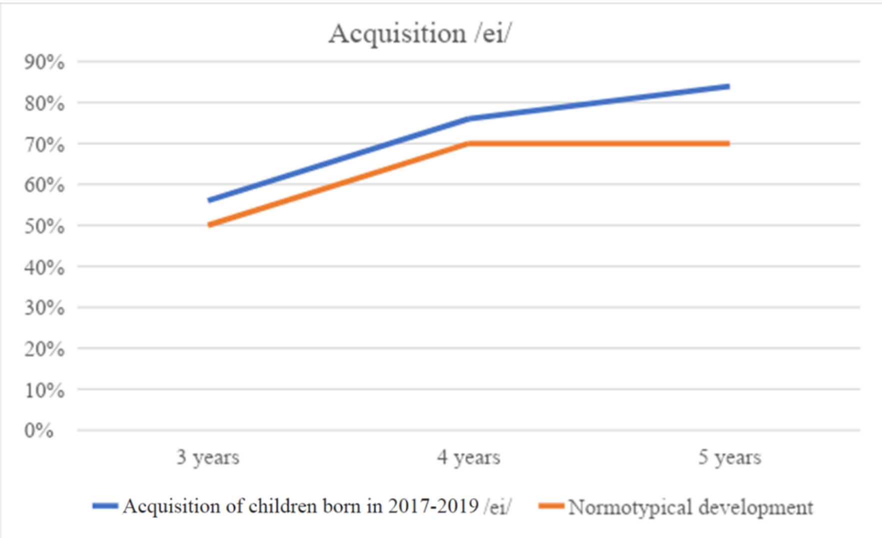
Chi-Squared Test (age)

Value = 1.19 df = 2, p = 0.55

Student's t-test (gender)

T = 0.74; df = 148; p = 0.45

(**b**) Acquisition of /ei/.



Chi-Squared Test (age)

Value = 10.31, df = 2, p = 0.006

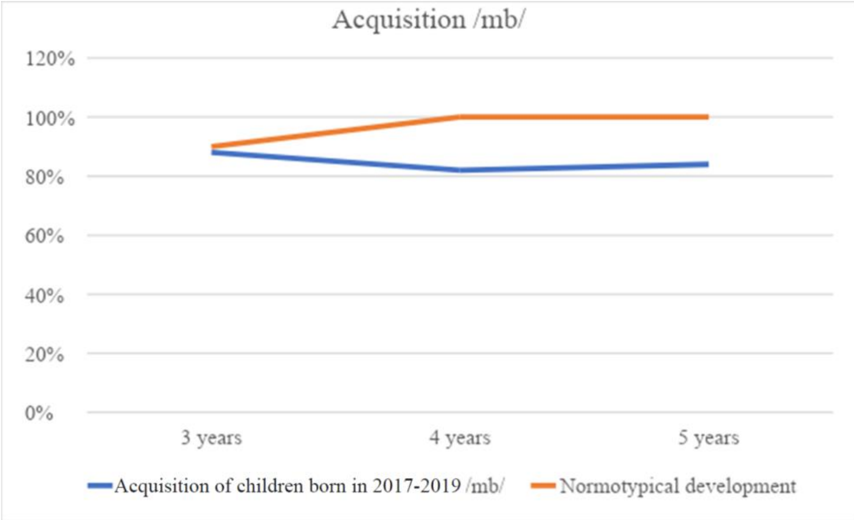
Student's t-test (gender)

T = 2.37; df = 148; p = 0.01

Figure 7. Acquisition of decreasing diphthongs among children born from 2017 to 2019 vs. normo-typical development according to Bosch.

Furthermore, the acquisition levels of specific groups of phonemes have been studied (see Figure 8). Variations in their acquisition among different age groups have been identified. Initially, the acquisition of some groups such as /sl/, /cl/, /gl/, /pl/, /rb/, and /lm/ were found to correspond to normo-typical development, being slightly above the expected averages. However, for most of the phonemes, there is evidence of a significant delay in acquisition. In this sense, the /mp/ and /nd/ groups are more acquired by the 3-year-old groups than by their 4- and 5-year-old counterparts, with the development of the latter being lower than expected for their age. On the other hand, the consonant groups (/pr/, /br/, /tr/, /fr/, /gr/) show a development level lower than the average expected for 4- and 5-year-olds. In these cases, the 3-year-old participants showed superior development in the acquisition of these groups than their 4- and 5-year-old counterparts.

(**a**) Acquisition of /mb/.



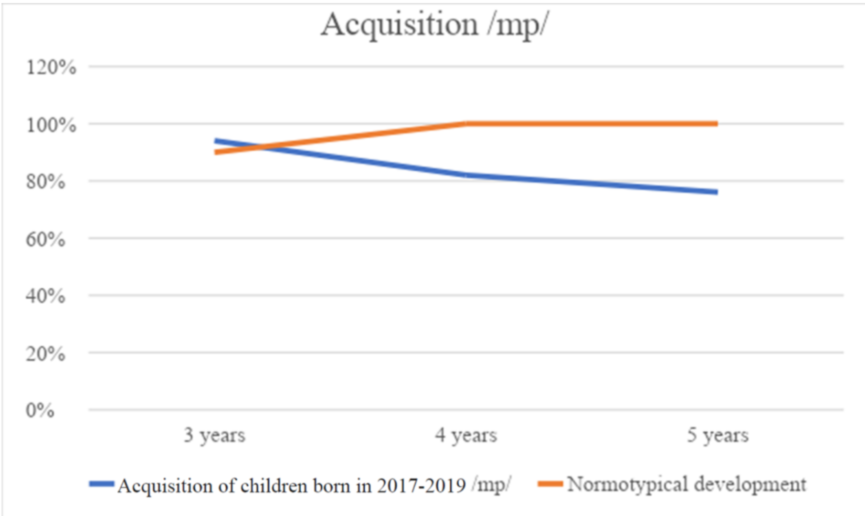
Chi-Squared Test (age)

Value = 0.71, df = 2, $p = 0.69$

Student's t-test (gender)

T = −0.36; df = 148; $p = 0.71$

(**b**) Acquisition of /mp/.



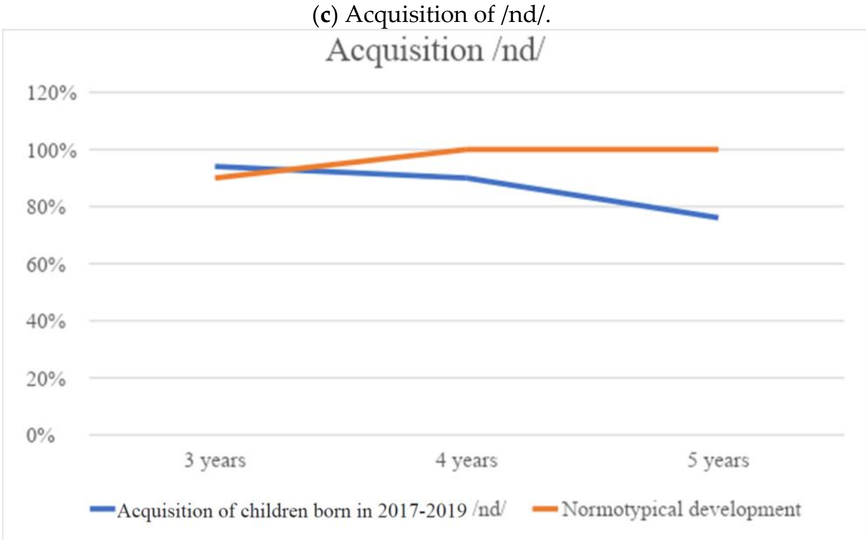
Chi-Squared Test (age)

Value = 6.25, df = 2, $p = 0.04$

Student's t-test (gender)

T = 2.10; df = 148; $p = 0.03$

(**c**) Acquisition of /nd/.



Chi-Squared Test (age)

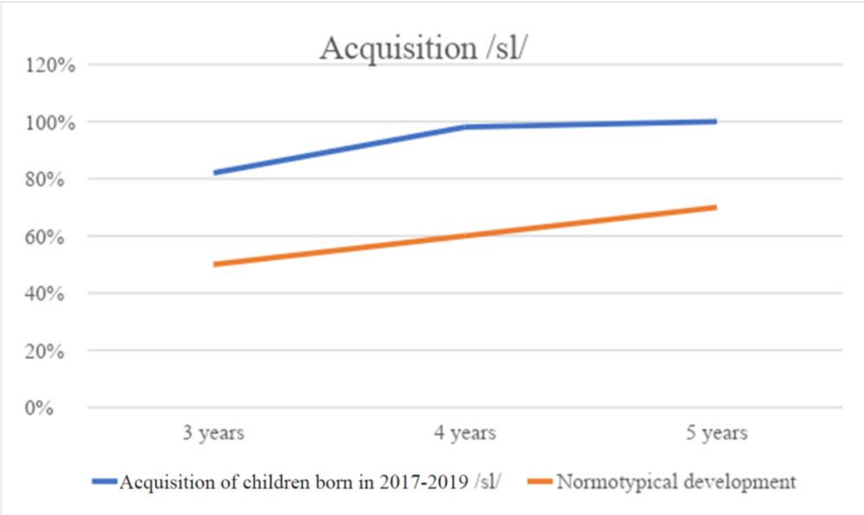
Value = 7.73, df = 2, $p = 0.02$

Student's t-test (gender)

T = 2.80; df = 148; $p = 0.006$

Figure 8. *Cont*.

(**d**) Acquisition of /sl/.



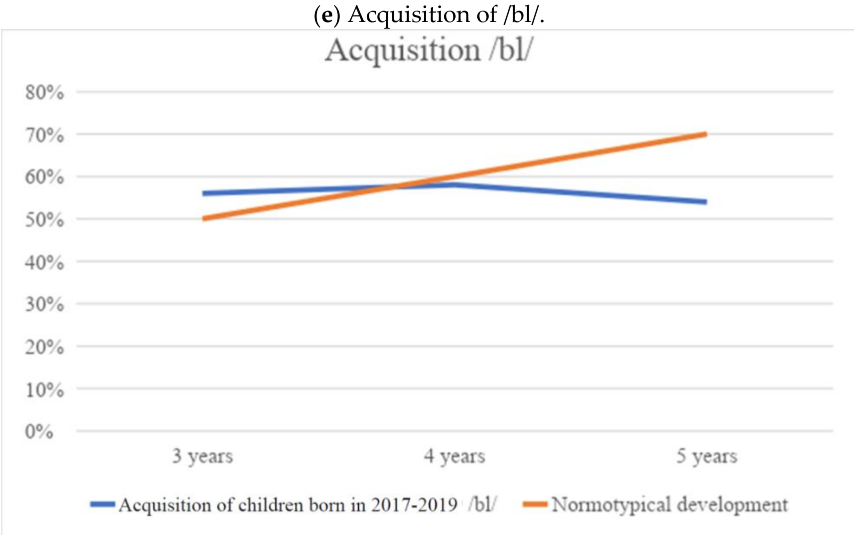
Chi-Squared Test (age)

Value = 15.64, df = 2, $p <$ 0.001

Student's t-test (gender)

T = −1.39; df = 148; $p = 0.16$

(**e**) Acquisition of /bl/.



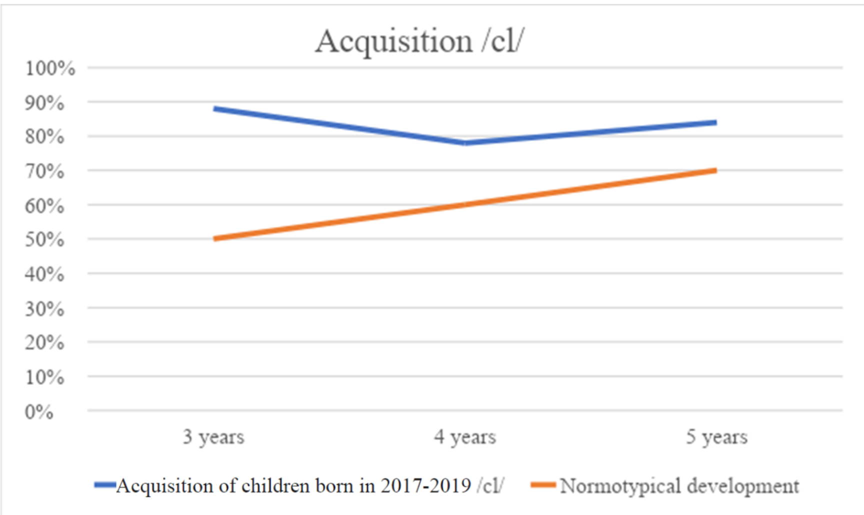
Chi-Squared Test (age)

Value = 1.35, df = 2, $p = 0.06$

Student's t-test (gender)

T = 0.69; df = 148; $p = 0.48$

(**f**) Acquisition of /cl/.



Chi-Squared Test (age)

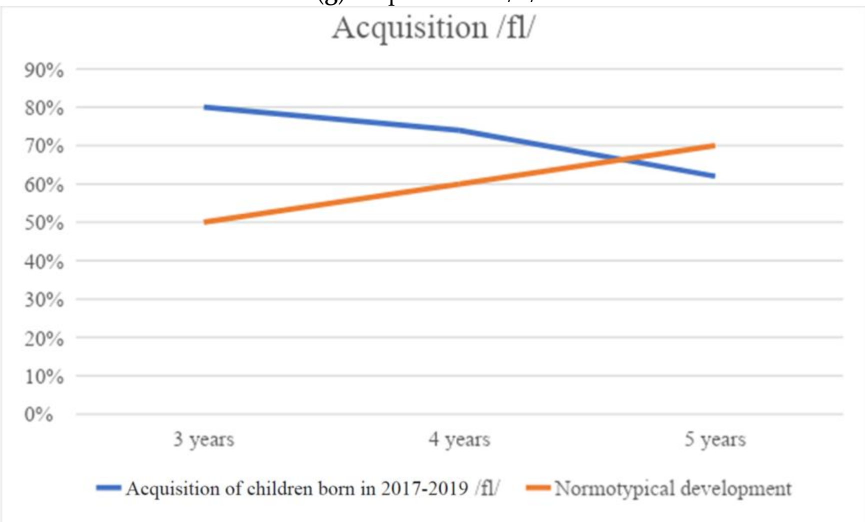
Value = 1.84, df = 2, $p = 0.40$

Student's t-test (gender)

T = 1.83; df = 148; $p = 0.06$

Figure 8. *Cont*.

(**g**) Acquisition of /fl/.



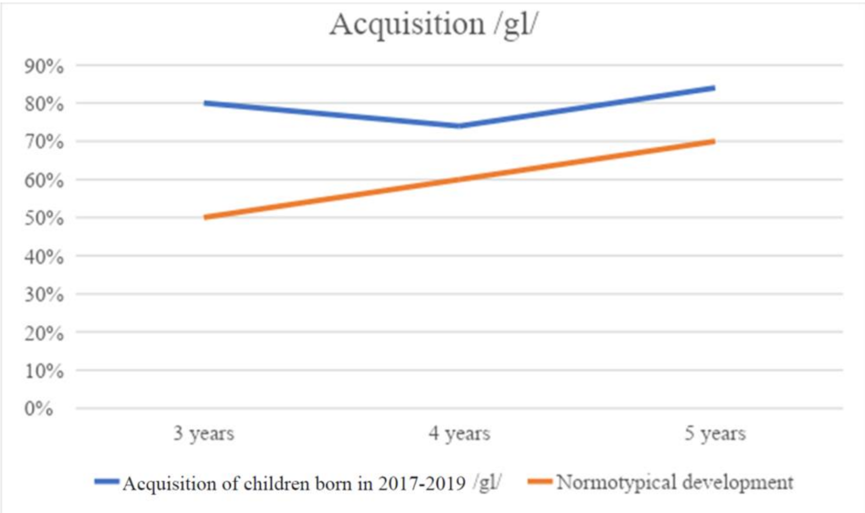
Chi-Squared Test (age)

Value = 4.16, df = 2, p = 0.12

Student's t-test (gender)

T = −0.56; df = 148; p = 0.57

(**h**) Acquisition of /gl/.



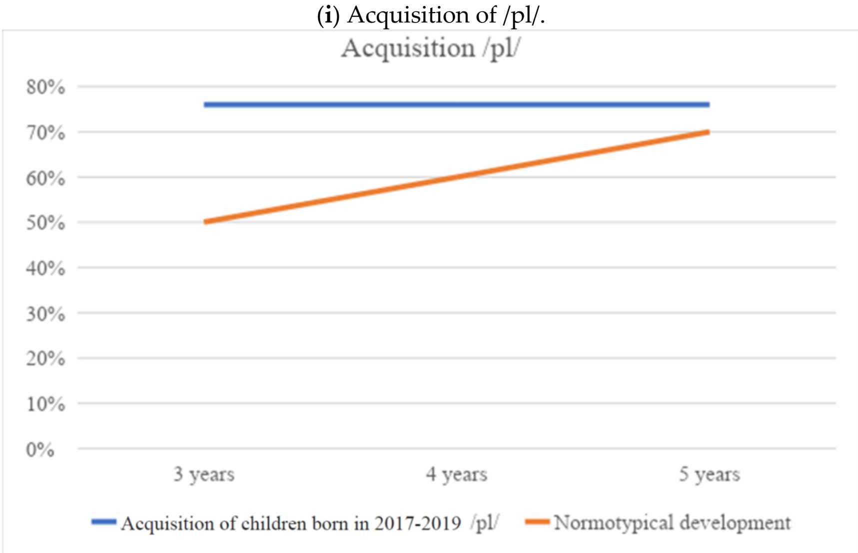
Chi-Squared Test (age)

Value = 1.54, df = 2, p = 0.46

Student's t-test (gender)

T = 0.83; df = 148; p = 0.40

(**i**) Acquisition of /pl/.



Chi-Squared Test (age)

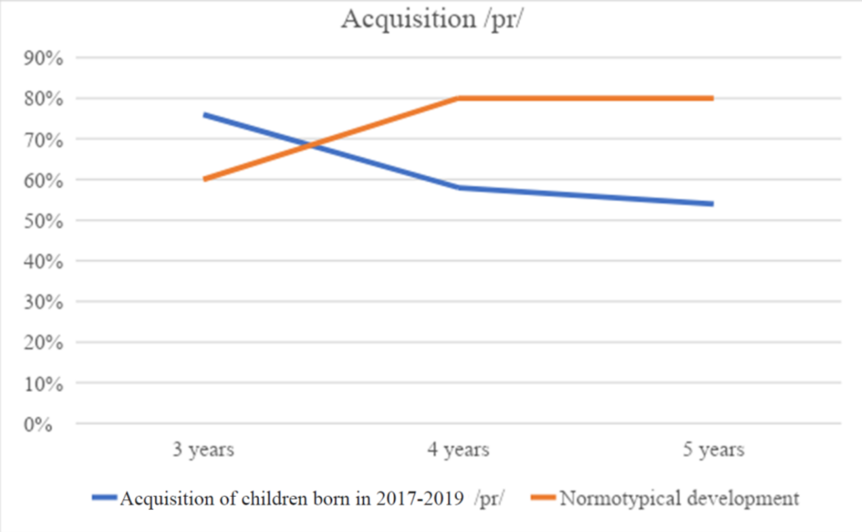
Value = 0.00, df = 2, p = 1.00

Student's t-test (gender)

T = 0.96; df = 148; p = 0.33

Figure 8. *Cont.*

(**j**) Acquisition of /pr/.



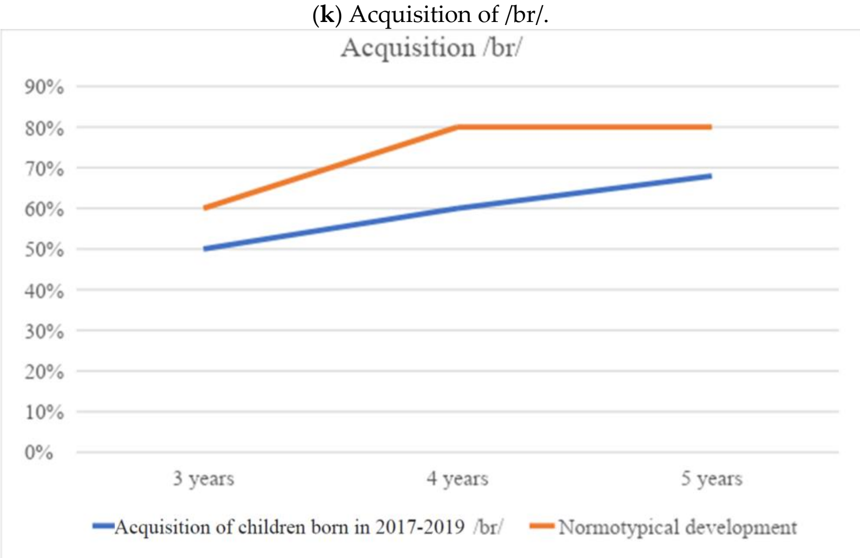
Chi-Squared Test (age)

Value = 5.87, df = 2, $p = 0.05$

Student's t-test (gender)

T = 0.42; df = 148; $p = 0.67$

(**k**) Acquisition of /br/.



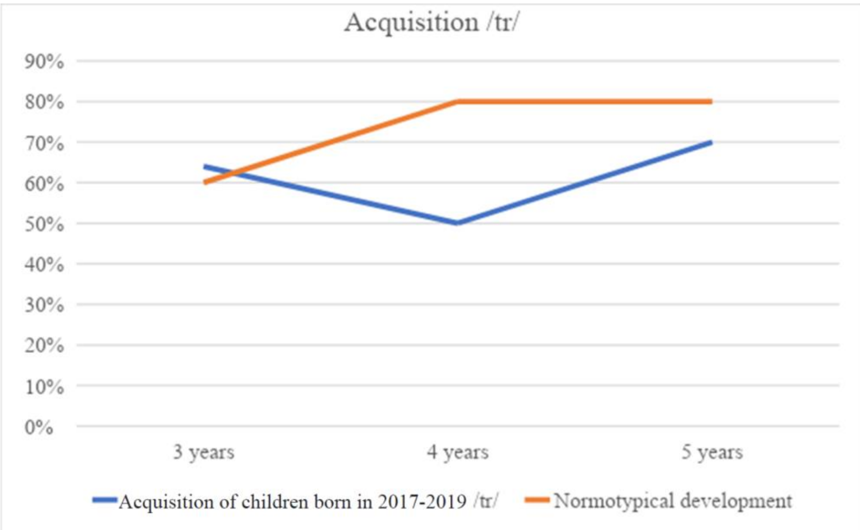
Chi-Squared Test (age)

Value = 3.71, df = 2, $p = 0.18$

Student's t-test (gender)

T = 0.89; df = 148; $p = 0.37$

(**l**) Acquisition of /tr/.



Chi-Squared Test (age)

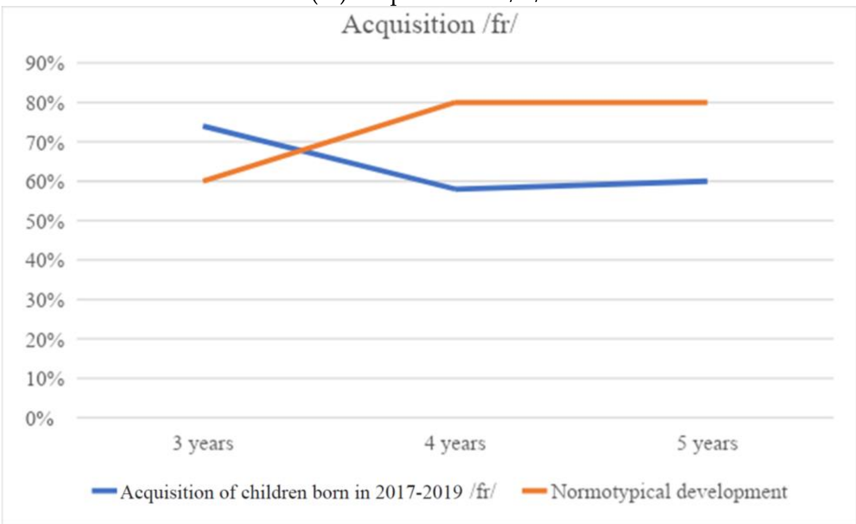
Value = 4.44, df = 2, $p = 0.10$

Student's t-test (gender)

T = −0.92; df = 148; $p = 0.35$

Figure 8. *Cont*.

(**m**) Acquisition of /fr/.



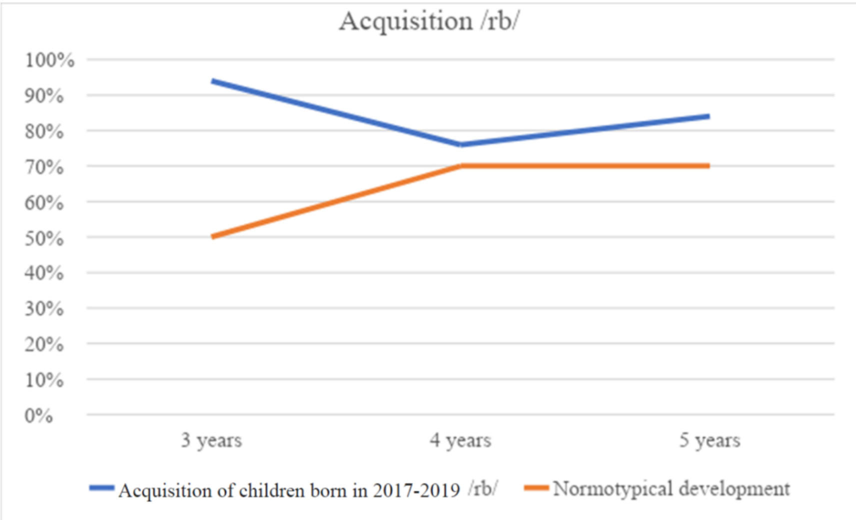
Chi-Squared Test (age)

Value = 3.29, df = 2, p = 0.19

Student's t-test (gender)

T = 0.77; df = 148; p = 0.44

(**n**) Acquisition of /rb/.



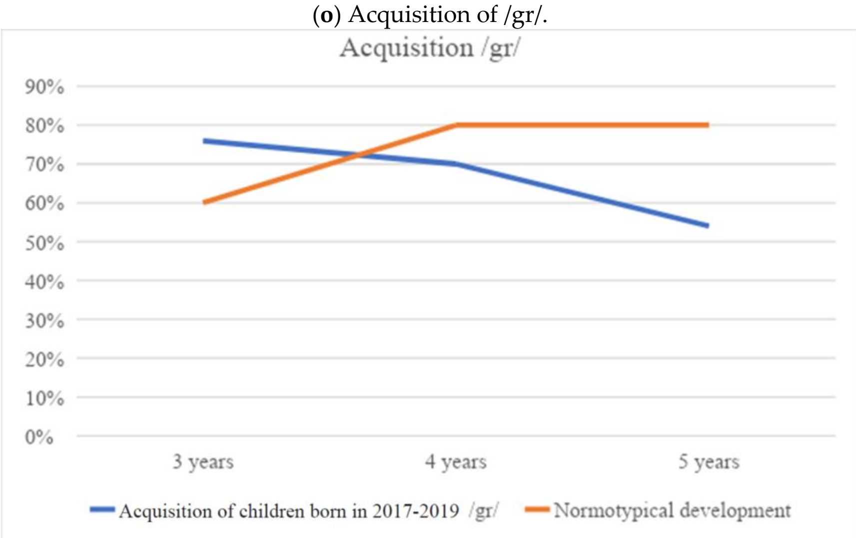
Chi-Squared Test (age)

Value = 6.26, df = 2, p = 0.04

Student's t-test (gender)

T = 0.53; df = 148; p = 0.59

(**o**) Acquisition of /gr/.



Chi-Squared Test (age)

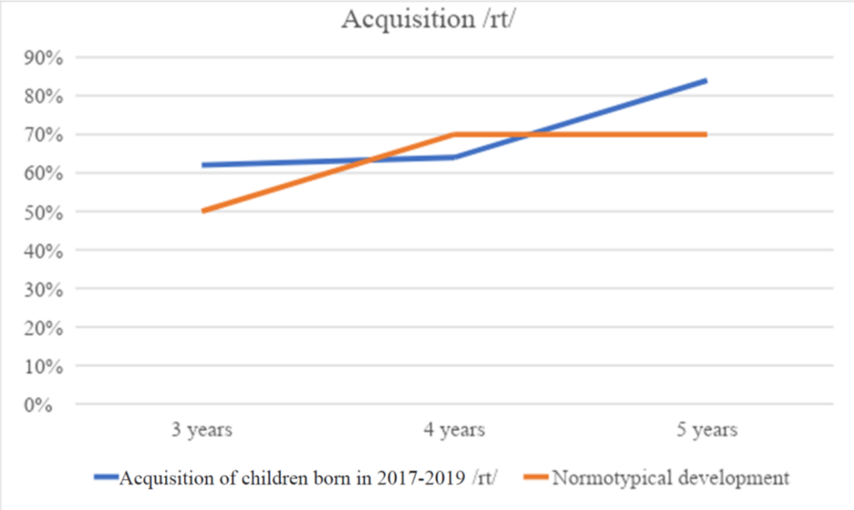
Value = 5.82, df = 2, p = 0.19

Student's t-test (gender)

T = 0.77; df = 148; p = 0.44

Figure 8. *Cont.*

(**p**) Acquisition of /rt/.



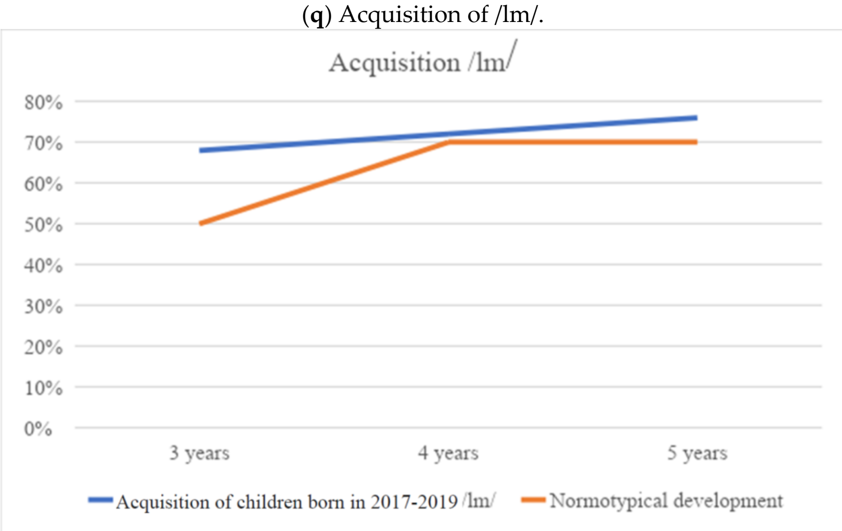
Chi-Squared Test (age)

Value = 7.04, df = 2, $p = 0.02$

Student's t-test (gender)

T = 1.75; df = 148; $p = 0.08$

(**q**) Acquisition of /lm/.



Chi-Squared Test (age)

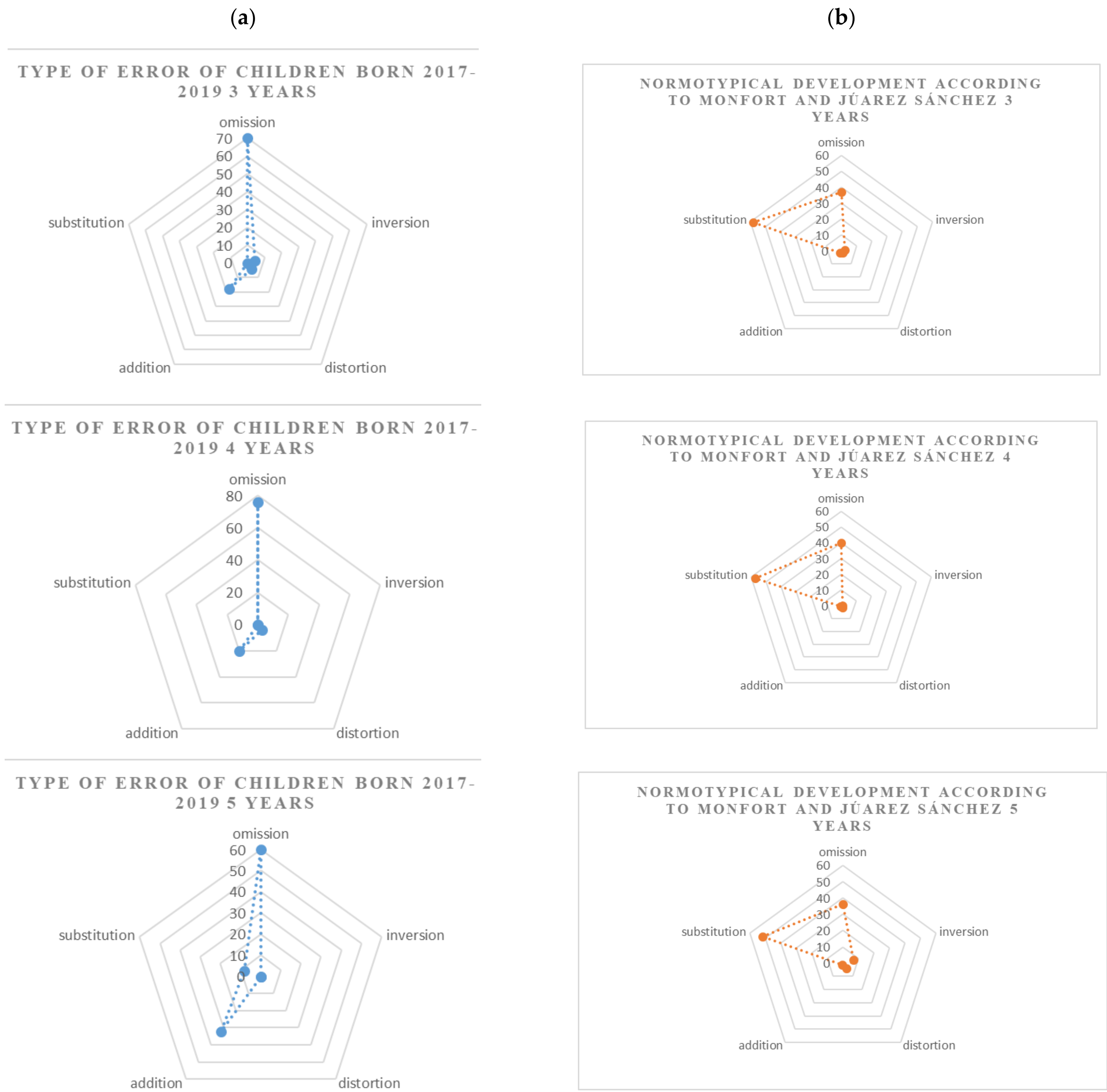
Value = 0.79, df = 2, $p = 0.67$

Student's t-test (gender)

T = 1.99; df = 148; $p = 0.04$

Figure 8. Acquisition of groups among children born from 2017 to 2019 vs. normo-typical development according to Bosch.

Regarding the types of non-target forms, it was found that most of them are produced by omission, which is consistent with the trend for child development as described in Monfort and Juárez Sánchez's work [44]. However, there are notable differences (see Figure 9): most of the non-target forms are omissions. In the current sample of 3-, 4-, and 5-year-olds, there are almost no substitutions, but we encountered some insertions. In fact, there is a weak and significant relationship between age and type of error (r.18, $p = 0.02$). However, the distribution of omitted phonemes is not homogeneous. Again, we found that the phonemes /r/, /rr/, /f/, the rising diphthongs /au/ and /ei/, the groups /mp/ and /nd/, and consonant groups such as /pr/ and /br/ had the highest number of omissions. Finally, it should be noted that no gender differences are evident.



Chi-Squared Tests (age)

8.509 ($p = 0.075$)

Figure 9. Type of error distributed by gender and age. (**a**) Type of error for children born from 2017 to 2019. (**b**) Normotypical development according to Monfort and Júarez.

4. Discussion

4.1. Impact of COVID-19 on Communication and Language Development

During the subsequent stage, from 18 months to 4 years of age, mandatory mask usage in educational settings was introduced, marking the onset of phonological difficulties, with notable omissions and insertions. According to Cuetos et al. [21], the phonological component of Spanish typically develops between the ages of 2 and 4 years old. By this stage, the acquisition of nasals and occlusives should be largely completed, although omissions and phoneme substitutions can occur [32,38].

However, our study's findings reveal severe difficulties in mastering these phonemes, accompanied by a high frequency of omission and insertions errors. This indicates not only an increased difficulty but also a shift in the types of errors being made.

During the third stage, from 4 to 6 years of age, there is a noticeable alteration in the typical acquisition pattern. It was observed that the liquid phonemes /r/ and /rr/ pose significant difficulties, whereas /ll/, despite being complex, does not present significant challenges [37]. The difficulty with the /r/ phoneme emerging at the age of 4 is surprising, given that 3-year-old participants fall within the normal range. This discrepancy could be linked to variations in mask usage flexibility during their recent school year, potentially benefiting the younger cohort.

Fricatives, known for their complexity in the Spanish language [37], align with the highest difficulty rates in our study, notably with /f/ and /θ/. Additionally, there was a notable delay in consonant clusters such as /mp/, /nd/, /sl/, /pr/, /rb/, and /rt/, which are typically acquired over time. While the study sample exhibited greater difficulties than expected for their age, it is premature to conclude there was a developmental delay [22,29,30,36,37].

As evident in the results, phonemes requiring mature buccofacial strength such as /r/, /ř/, /bl/, /fl/, /br/, /fr/, /gr/, /pr/, and /tr/ coincide with those posing difficulty most frequently. Furthermore, phonemes like /θ/, which demand precise tongue positioning for air expulsion, also pose challenges possibly exacerbated by the lack of visual cues, as highlighted by Lewkowicz and Hansen-Tift [17], emphasizing the crucial role of lip movements in language acquisition.

Lastly, while difficulties were observed in the rising diphthongs /ia/, /ie/, and /io/, which are typically acquired by six years of age [23], the children in this study, despite their challenges, demonstrate attainment within expected developmental norms for their age, suggesting achievable acquisition with appropriate support.

4.2. Impact of Mask Usage on Phoneme Identification

Language acquisition, as described by some authors such as Skinner [45], is viewed as a behavior learned through imitation, association, and reinforcement. The mandatory use of masks has been shown to alter the capacities for imitation, association, and reinforcement in the process of oral language learning [45,46]. Consequently, acquisition through imitation [46] is impacted.

According to the results obtained, individuals lacking a visual model of phonatory articulation may experience difficulties in differentiating and producing phonemes [46]. This observation could explain the high incidence of non-target forms.

Upon analyzing the data in relation to this study's overarching objective, it becomes evident that mask usage may have influenced the difficulties children aged 3, 4, and 5 experienced in identifying acquired phonemes. According to Bosch's phoneme acquisition patterns [30], the children exhibited greater difficulties than expected for their developmental stage. This discrepancy could be attributed to the COVID-19 pandemic, which, as observed in previous studies like Murphy's research [10] on communication during COVID-19, has significantly altered communication norms. Similarly, studies such as Hernandez et al.'s [2] underscore the profound impact of the pandemic on the educational community, including language skills.

Furthermore, pre-pandemic studies such as those conducted by McGurk and MacDonald [14] and Ortega et al. [16] have highlighted the influence of vision on auditory perception and subsequent oral production. This underscores the deficit observed among our study participants due to the lack of visual information [10–13].

4.3. Deviation from Expected Phoneme Acquisition Patterns

Monfort and Juárez [20] assert that the development of phonological competence follows a well-defined sequence, and deviations found in this study suggest a delay in linguistic acquisition within the phonetic domain that may have implications in subsequent developmental stages. This delay could be attributed to mask usage, which obstructs one's view of phonatory elements. Monfort and Juárez [20] further note that phonological competence develops progressively as individuals adapt to producing sounds according to language models in their environment.

Authors such as Ingram [24], Gallardo-Ruiz and Gallego-Ortega [25], and Li et al. [26] categorize phonetic–phonological acquisition into four stages. According to Santrock [47], the second stage, occurring from 12 to 18 months, marks the onset of first words, characterized by the use of consonants producing occlusive sounds such as /p/, /t/, and /k/ and nasals like /m/, /n/, and /ñ/, alongside vowel sounds like /a/, /u/, and /i/ [30].

However, the study's sample of 4- and 5-year-olds demonstrates delays in the acquisition of the nasals /m/, /n/, and /ñ/ and the occlusives /p/, /t/, /k/, /b/, /d/, and /g/—phonemes that should typically be consolidated by this age [30]. This delay contrasts with earlier developmental expectations when mandatory mask usage was not in effect during the participants' 12- to 18-month age range, allowing for visual reinforcement to complement auditory learning and follow a typical acquisition pattern according to developmental stages. Despite this, the acquisition of decreasing diphthongs was not associated with such difficulties, aligning with expectations for this developmental period [30].

4.4. Gender Differences and Language Acquisition

Historically, significant gender differences have been noted in language acquisition [39–42]. However, while no significant differences were found in the total number of erroneous words and phonemes between boys and girls in this study, notable difficulties were observed in specific phonemes and groups, contrasting with previous research findings [48–50]. The study suggests that boys may have been more affected by these challenges, aligning with broader observations in the context of language disorders [51–53].

4.5. Study Limitations

This study has some limitations. In the present study, the normo-typical development of children (monolingual) with Spanish as their mother tongue was known; however, it is not known how the same situation would affect the bilingual population and children who speak a language different from Spanish and whose closest form of context, such as family members, does not know the language well. The data used are contextualized in the post-pandemic stage, in which the population of 3, 4, and 5 -year-olds, mainly, lived with masks and social distancing throughout their schooling. It is therefore an atypical situation that may trigger, in addition to language difficulties, other altered social factors. Furthermore, one limitation of this study derived from the instrument used. First, to ensure a higher reliability of the research design, it would be beneficial to have not one but multiple human assessors of correctness of children's pronunciation with an evaluation of compatibility of these judgments. Second, human assessors' perceptions should be coupled with an acoustic analysis of the audio recordings of children's speech production to establish the exact sound characteristics and their differences from those identified as 'normal' in previous research. We have also included, as a prospective study, the promise of carrying out such tasks in the future in an adequate manner.

This study is based on an educational need presented by early-childhood education teachers. The study provides a new contribution to child language development because the use of masks, social isolation, the closure of playgrounds, and confinement (anti-COVID-19 socks) are such recent developments that there are no significant studies that relate the use of masks to oral language difficulties, coinciding with the main strength of this study. Therefore, the results obtained suggest important implications for educational practice. In this way, our study outlines a need to provide assistance to children who experience phonetic–phonological difficulties.

In this way, the need to address this learning difficulty through educational policies and provide the centers with material and human resources is raised.

As shown in the present study, there are difficulties in phonetic acquisition, so there could be difficulties in reading and writing skills as well. In this sense, Serrano [54] contends that some linguistic disorders such as developmental dyslexia present deficits at phonological-processing levels. Thus, the findings make it a priority to promote future studies that examine the difficulties caused and their influence on the rest of the language dimensions at later stages of development. Such correlation allows for more effective intervention and/or prevention. Thus, intervention could be based on improving linguistic competence, the position of buccofacial elements, praxias, facial strengthening, blowing, and language stimulation with greater emphasis on the phonetic difficulties detected. The importance of early stimulation programs that function based on attention, auditory discrimination, and oral–facial motor skills is highlighted, as these are prerequisites for the correct acquisition of language. In this sense, the use of play-based teaching methodologies such as attention–sound discrimination activities, oral–facial motor games, and imitation and breathing games is recommended [55]. In addition, activities directly linked to oral expression should be developed, such as narratives, dramatizations or simple role-playing games, word games, riddles, songs, or simple poetry. Early intervention can prevent major difficulties related to language, which also influences human behavior. The essential objective is to offer individualized and comprehensive educational attention to children who need to functionally adapt to the environment in which they are immersed.

4.6. Practical Applications

From this study, a series of practical consequences can be identified, which we enumerate below.

We recommend enhancing early-education activities aimed at stimulating language development from an early age in educational settings.

It will be also important to develop methodological adjustments in teaching, i.e., revising teaching methods for writing and reading to prioritize the development of phonological awareness and discrimination. This should be followed by emphasizing praxis, semantics, and eventually morphosyntax.

Another relevant aspect would be to improve assessment and intervention strategies by developing assessment tools and intervention strategies tailored to addressing the observed delays in language development among young children, particularly those affected by prolonged use of facemasks and pandemic-related social changes. In this regard, in this study, we detected a scarcity of instruments that assess children's phonological development and have adequate reliability. Therefore, it is essential to include in instructional manuals the requirement for multiple individuals to assess the correctness or incorrectness of pronunciation. This ensures compatibility in their judgments. It would also be necessary to conduct an acoustic phonetic analysis of child speech.

It is critical to consider professional development for educators that provides training opportunities to equip them with effective strategies to support language development among children navigating post-pandemic educational settings.

Finally, encouraging the participation of the community and parents in the development of language skills through interactive environments is essential to reinforce the support provided in schools.

5. Conclusions

As conclusions drawn from this descriptive and exploratory study, several hypotheses for future research can be formulated to validate the obtained results. This study observed that while 3-year-old children exhibited language development and phonological competence equal to or exceeding scientific norms established for a typically developing population, performance declined below average at ages 4 and 5. This decline coincides with age groups experiencing prolonged exposure to the pandemic and consistent use of masks.

Moreover, contrary to typical expectations of substitution non-target forms at this age, the children in this study, educated during the pandemic, displayed non-target forms predominantly related to insertion and omission. While no significant differences were generally found between groups and sexes, notable deviations from normative standards for Spanish-speaking children were observed.

Consequently, we propose that there is a need for a prospective longitudinal study to ascertain whether the observed delay in language development can be significantly attributed to mask usage or if other social factors such as reduced social interactions, decreased social activity time, shifts towards digital communication over physical interaction, and other pandemic-related lifestyle changes also play significant roles. These variables collectively warrant investigation to determine their impact on language development within this population.

Additionally, it is essential to separately evaluate the social and educational impacts of these findings. How does the studied form of language development delay influence social interactions and knowledge acquisition? Does it affect Spanish-speaking populations differently than Anglo-Saxon speakers who use less transparent languages?

These practical implications underline the importance of enhancing early-age language stimulation activities in schools, revising methodologies for teaching reading and writing to prioritize phonological awareness and discrimination, and, subsequently, praxis, semantics, and morphosyntax development.

From a theoretical standpoint, this study's findings on prevalent non-target forms in language development among the studied age groups are significant and call for adjustments in the educational strategies as mentioned above. However, further detailed and longitudinal studies are essential to determine the persistence of pandemic-induced social changes in society and their ongoing impact on language development.

Therefore, these results should be interpreted with caution, and continued research efforts are necessary to validate and expand upon these findings.

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Institutional Review Board Statement: The research was also approved by the school management teams. In accordance with Organic Law 15/1999 of 13 December on the Protection of Personal Data (1999, BOE no. 298 of 14 December), all parents of the participants signed an informed consent document authorizing the participation of their children in this study. In addition, and following the guidelines of the aforementioned law, the teachers signed a confidentiality agreement. No special ethics approval was required for this research since the Spanish public education system and national regulations do not require such approval. Each participant received a small reward (two chocolates) as a token of our gratitude for their participation.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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References

1. Corral, D.; Fernández, J.J. La educación al descubierto tras la pandemia del COVID-19. Carencias y retos. *Aularia País Las Aulas* **2021**, *10*, 21–28.
2. Hernández, M.A.; Labanda, A.; Prado, A. Consecuencias psicoeducativas y emocionales de la pandemia, el confinamiento y la educación a distancia en el alumnado y la comunidad educativa. *Particip. Educ.* **2021**, *8*, 75–88.
3. Galiano, M.D.; Prado, R.F.; Mustelier, R.G. Salud mental en la infancia y adolescencia durante la pandemia de COVID-19. *Rev. Cuba. Pediatría* **2020**, *92*, e1342.

4. García, T. El impacto emocional de la pandemia en docentes y alumnado. *Particip. Educ.* **2021**, *8*, 91–103.
5. Jiao, W.Y.; Wang, L.N.; Liu, J.; Fang, S.F.; Jiao, F.Y.; Pettoello-Mantovani, M.; Somekh, E. Behavioral and Emotional, Disorders in Children during the COVID-19 Epidemic. *Rev. Chil. Psiquiatr. Neurol. Infanc.-Adolesc.* **2020**, *32*, 264–266. [CrossRef]
6. Moreno, R.; Machado, M. Formas de maltrato infantil que pudieran presentarse durante el confinamiento debido a la COVID-19. *Rev. Cuba. Pediatría* **2020**, *92*, e1241.
7. Sánchez Boris, I.M. Impacto psicológico de la COVID-19 en niños y adolescentes. *MediSan* **2021**, *25*, 123–141.
8. Orgilés, M.; Morales, A.; Delveccio, E.; Mazzeschi, C.; Espada, J.P. Immediate psychological effects of the COVID -19 quarantine in youth from Italy and Spain. *Front. Psychol.* **2020**, *11*, 579038. [CrossRef]
9. Storz, M. The COVID-19 Pandemic: An Unprecedent Tragedy in the Battle Against childhood Obesity. *Clin. Exp. Pediatr.* **2020**, *63*, 477–482. [CrossRef]
10. Murphy, M. COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemp. Secur. Policy* **2020**, *41*, 492–505. [CrossRef]
11. Blazhenkova, O.; Dogerlioglu-Demir, K.; Booth, R.W. Masked emotions: Do face mask patterns and colors affect the recognition of emotions? *Cogn. Res. Princ. Implic.* **2022**, *7*, 33. [CrossRef] [PubMed]
12. Lau, W.K.; Chalupny, J.; Grote, K.; Huckauf, A. How sign language expertise can influence the effects of face masks on non-linguistic characteristics. *Cogn. Res. Princ. Implic.* **2022**, *7*, 53. [CrossRef]
13. Schlegtendal, A.; Eitner, L.; Falkenstein, M.; Hoffmann, A.; Lücke, T.; Sinningen, K.; Brinkmann, F. To Mask or Not to Mask—Evaluation of Cognitive Performance in Children Wearing Face Masks during School Lessons (MasKids). *Children* **2022**, *9*, 95. [CrossRef]
14. McGurk, H.; McDonald, J. Hearing lips and seeing voices. *Nature* **1976**, *264*, 746–748. [CrossRef]
15. Kidd, E.; Garcia, R. How diverse is child language acquisition research? *First Lang.* **2022**, *42*, 703–735. [CrossRef]
16. Ortega-Llebaria, M.; Faulkner, A.; Hazan, V. Auditory-Visual L2 Speech Perception: Effects of Visual Cues and Acoustic-Phonetic Context for Spanish Learners of English. *Speech Hear. Lang. Work. Prog.* **2001**, *13*, 39–51.
17. Lewkowicz, D.J.; Hansen-Tift, A.M. Infants deploy selective attention to the mouth of a talking face when learning speech. *Proc. Natl. Acad. Sci. USA* **2012**, *109*, 1431–1436. [CrossRef]
18. Palmeiro, S.; Cebral, M. Voces autorizadas en Twitter durante la pandemia de COVID-19. Actores, léxico y sentimientos como marco interpretativo para usuarios ordinarios. *Rev. Comun. Y Salud* **2020**, *10*, 549–568. [CrossRef]
19. Swets, B.; Fuchs, S.; Krivokapić, J.; Petrone, C. A cross-linguistic study of individual differences in speech planning. *Front. Psychol.* **2021**, *12*, 655516. [CrossRef]
20. Monfort, M.; Juárez, A. *El Niño que Habla: El Lenguaje Oral en Preescolar*, 18th ed.; CEPE: Madrid, Spain, 2019; pp. 15–29.
21. Cuetos Vega, F.; González, J.; de Vega, M. *Psicología del Lenguaje*; Medica Panamericana: Madrid, Spain, 2015; pp. 145–170.
22. Leonard, L.B. Developmental Language Disorder and the role of language typology. *Enfance* **2022**, *1*, 25–39. [CrossRef]
23. Aguilar Alonso, A. *Psicopatología del Lenguaje: Variables de Intervención*; PPU: Barcelona, Spain, 2003; pp. 145–173.
24. Ingram, D. *First Language Acquisition: Method, Description and Explanation*; Cambridge University Press: New York, NY, USA, 1989; pp. 32–57.
25. Gallardo Ruiz, J.R.; Gallego Ortega, J.L. *Manual de Logopedia Escolar: Un Enfoque Práctico*; Ediciones Aljibe: Barcelona, Spain, 2003; pp. 73–84.
26. Li, S.; Hiver, P.; Papi, M. *The Routledge Handbook of Second Language Acquisition and Individual Differences*; Taylor & Francis: New York, NY, USA, 2022; pp. 267–282.
27. Papalia, D.; Olds, S.; Feldman, R. *Psicología del Desarrollo*; McGraw-Hill: México, Mexico, 2001; pp. 247–261.
28. Cervera, J.; Ygual, A. Intervención logopédica en los trastornos fonológicos desde el paradigma psicolingüístico del procesamiento del habla. *Rev. Neurol.* **2003**, *36*, 39–53. [CrossRef]
29. Aguilar, E. Comparación entre la adquisición de la fonología castellana y catalana a partir del AREHA y del AREPA. *Rev. Logop. Foniatría Audiol.* **2005**, *25*, 104–114. [CrossRef]
30. Bosch, L. Trastornos del desarrollo fonético y fonológico. In *Manual de Desarrollo y Alteraciones del Lenguaje*; Puyuelo, M., Rondal, J.A., Eds.; Masson: Barcelona, Spain, 2003; pp. 189–204.
31. Ibbotson, P. *Language Acquisition: The Basics*; Taylor & Francis: London, UK, 2022; pp. 71–101.
32. Coloma, C.; Pavez, M.M.; Maggiolo, M.; Peñaloza, C. Desarrollo fonológico en niños de 3 y 4 años según la fonología natural: Incidencia de la edad y del género. Universidad de Chile. *Rev. Signos* **2010**, *43*, 31–48. [CrossRef]
33. Maggiolo, M.; Coloma, C.; Pavez, M.M. Comprensión de narraciones orales en niños con Trastorno Específico del Lenguaje. *Actual. En Psicol.* **2013**, *27*, 129–140.
34. Jakobson, R.; Waugh, L.R. *The Sound Shape of Language*, 3rd ed.; Walter de Gruyter: Berlin, Germany, 2002; pp. 7–81.
35. Vila, I. Adquisición de lenguaje. In *Desarrollo Psicológico y Educación. Necesidades Educativas Especiales y Aprendizaje Escolar*, 5th ed.; Marchesi, A., Palacios, J., Coll, C., Eds.; Alianza Editorial: Madrid, Spain, 1992; Volume 1, pp. 85–98.
36. Bosch, L. El desarrollo fonológico infantil: Una prueba para su evaluación. *Anu. Psicol.* **1983**, *28*, 86–111.
37. Narbona, J. Los trastornos del lenguaje. In *Psicopatología del Niño y del Adolescente*; Rodríguez Sacristán, J., Ed.; Universidad de Sevilla: Sevilla, Spain, 1995; Volume 1, pp. 483–504.
38. To, C.K.S.; McLeod, S.; Sam, K.L.; Law, T. Predicting Which Children Will Normalize Without Intervention for Speech Sound Disorders. *J. Speech Lang. Hear. Res.* **2022**, *65*, 1724–1741. [CrossRef]

39. Bizama, M.; Arancibia, B.; Sáez, K. Evaluación de la conciencia fonológica en párvulos de nivel transición 2 y escolares de primer año básico, pertenecientes a escuelas vulnerables de la Provincia de Concepción, Chile. *Onomázein* **2011**, *23*, 81–103. [CrossRef]
40. Garayzábal, E. *Lingüística Clínica y Logopedia*; Antonio Machado Libros: Madrid, Spain, 2006; pp. 367–422.
41. Bouchon, C.; Hochmann, J.R.; Toro, J.M. Spanish-learning infants switch from a vowel to a consonant bias during the first year of life. *J. Exp. Child Psychol.* **2022**, *221*, 105444. [CrossRef]
42. Karmiloff, K.; Karmiloff-Smith, A. *Hacia el Lenguaje*; Ediciones Morata: Madrid, Spain, 2005; pp. 79–88.
43. Monfort, M.; Sánchez, A.J. *Registro Fonológico Inducido*, 6th ed.; Editorial CEPE: Madrid, Spain, 2006; pp. 17–23.
44. Monfort, M.; Sánchez, A.J. Registro Fonológico Inducido. *Rev. Logop. Foniatría Y Audiol.* **1988**, *8*, 88–96. [CrossRef]
45. McLaughlin, S.F. Verbal behavior by BF Skinner: Contributions to analyzing early language learning. *J. Speech Lang. Pathol.–Appl. Behav. Anal.* **2010**, *5*, 114–131. [CrossRef]
46. Martín, C.; Navarro, J. *Psicología del Desarrollo Para Docentes*; Ediciones Pirámide: Madrid, Spain, 2015; pp. 75–96.
47. Santrock, J. *Infancia*; MCGrawHill: Madrid, Spain, 2003; pp. 162–168.
48. Maza, N. Estudio Comparativo del Lenguaje Oral en Niños de Cuatro Años de la I.E.P. Christian Barnard College y la I.E.I. Niña María. Thesis of Degree in Initial Education, Universidad César Vallejo, Lime, Peru, 2017.
49. Dodd, B.; Holm, A.; Hua, Z.; Crosbie, S. Phonological development: A normative study of British English-speaking children. *Clin. Linguist. Phon.* **2003**, *17*, 617–643. [CrossRef] [PubMed]
50. Roberts, J.; Burchinal, M.; Footo, M. Phonological process decline from 2 1/2 to 8 years. *J. Commun. Disord.* **1990**, *23*, 205–217. [CrossRef] [PubMed]
51. Cho, E.; Xie, H.; Lalor, J.P.; Kumar, V.; Campbell, W.M. Efficient semi-supervised learning for natural language understanding by optimizing diversity. In Proceedings of the 2019 IEEE Automatic Speech Recognition and Understanding Workshop (ASRU), Singapore, 14–18 December 2019.
52. Choudhury, N.; Benasich, A.A. A family aggregation study: The influence of family history and other risk factors on language development. *J. Speech Lang. Hear. Res.* **2003**, *46*, 261–272. [CrossRef] [PubMed]
53. Leppänen, P.H.; Lyytinen, H.; Choudhury, N.; Benasich, A.A. Neuroimaging measures in the study of specific language impairment. In *Classification of Developmental Language Disorders*; Verhoeven, L., Balkom, H.V., Eds.; Lawrence Erlbaum Associates, Inc., Publishers: Mahwah, NJ, USA, 2003; pp. 111–148.
54. Serrano, M. Estimulación del lenguaje oral en Educación Infantil. *Rev. Digit. Investig. Y Educ.* **2006**, *22*, 1–46.
55. Santrock, J. *Desarrollo Infantil*; MC GrawHill: Madrid, Spain, 2004; pp. 305–314.