

Preschoolers' cognitive-linguistic performance in different educational contexts

Bianca Arruda Manchester de Queiroga¹ 

Angélica Galindo Carneiro Rosa² 

Thaís Braga³ 

Jéssica Katarina Olímpia de Melo¹ 

Simone Aparecida Capellini⁴ 

¹ Universidade Federal de Pernambuco - UFPE, Recife, Pernambuco, Brasil.

² Universidade Federal de Pernambuco – UFPE; Universidade São Miguel, Recife, Pernambuco, Brasil.

³ Clínica Particular - Thaís Braga Consultoria em Fonoaudiologia, Teresópolis, Rio de Janeiro, Brasil.

⁴ Universidade Estadual Paulista "Júlio de Mesquita Filho", Faculdade de Filosofia e Ciências – FFC/Unesp, Marília, São Paulo, Brasil.

ABSTRACT

Purpose: to investigate preschoolers' cognitive-linguistic performance in different educational settings.

Methods: thirty-nine children aged 4:0 to 5:11 years, enrolled in two private preschools from different Brazilian regions, were assessed with the Protocol for the Early Identification of Reading Problems, in the version adapted to preschool – which includes the following tests: alphabet knowledge; metaphonological skills; phonological working memory; rapid automatized naming; silent word reading; and hearing sentence comprehension based on figures. The groups were compared with the Mann-Whitney statistical test, and significant differences were set at $p < 0.05$.

Results: as expected, data revealed different performances between preschoolers from the two schools. The worse results in both were related to rhyme production and rhyme identification, which reveals that phonological awareness is probably not being stimulated in these groups. Participants performed as expected or "under attention" in the other skills.

Conclusion: the performances of preschoolers from both schools were identified and classified, revealing differences in cognitive-linguistic performances between the different educational settings. These results ratify the importance of a teaching approach that helps develop cognitive-linguistic skills, early in preschool.

Keywords: Child Rearing; Cognition; Language

A study conducted at Universidade Federal de Pernambuco, Recife, Pernambuco, Brazil.

Financial support: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), process number 409754/2021-8.

Conflict of interests: Nonexistent.

Corresponding author:

Bianca Arruda Manchester de Queiroga
Universidade Federal de Pernambuco,
Departamento de Fonoaudiologia
Avenida Professor Artur de Sá, S/N,
Cidade Universitária
CEP: 50.740-521 - Recife, Pernambuco,
Brasil
E-mail: bianca.queiroga@ufpe.br

Received on: February 14, 2023
Accepted on: July 26, 2023



This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Preschool is the first stage of basic education, aiming at the overall development of children up to 5 years old in physical, psychological, intellectual, and social aspects, complementing the family's and community's actions. It must be provided in day care centers or equivalent institutions for children up to 3 years old and preschools for those 4 or 5 years old¹.

Children's first school years are the most important ones for their social, communication, and learning development. During this phase, the school and family must monitor the development of their language and other cognitive skills to take measures as soon as possible if they perceive any difficulties. Hence, preschool professionals must have instruments available to monitor the development of cognitive-linguistic skills considered predictive of learning to read and write². Moreover, considering that such development depends on stimuli and interactions experienced at home and school, assessing these skills is crucial to decision-making regarding the best pedagogical practices for this target public^{2,3}.

Studies indicate a positive association between linguistic and cognitive development, indispensable pillars of school learning. Linguistic skills considered predictive of learning to read include phonology, syllabic and phonemic awareness, morphology, discourse, and pragmatics, while the cognitive skills are auditory and visual information processing, processing speed, attention, memory, planning, and organization^{4,5}.

More directly related to the initial process of learning to read and write, the literature highlights skills that comprise phonological processing, such as phonological awareness, phonological memory, and rapid serial naming. These competencies are associated with successful learning because they are respectively responsible for the capacity to analyze the sound structure of speech, retain information, and quickly access the language's representations of the phonological information⁶. Thus, these skills should be developed during the final preschool years to prepare students for the challenges of learning to read and write, which takes place at the beginning of elementary school⁷.

Therefore, addressing cognitive-linguistic skills since preschool provides children with greater understanding and autonomy to meet the challenges of learning to read and write. It also allows them greater time to deal with possible difficulties and solve or minimize them before they enter elementary school. Studies also

argue that early stimulating these skills minimizes the effects of existing gaps due to individual, cultural, and socioeconomic differences – thus decreasing discrepancies caused by unequal educational opportunities, so common in the country^{2,5,7}.

Nevertheless, despite recognizing that the stimulation of children's cognitive-linguistic skills before they begin learning to read and write is beneficial to such process^{2,7}, research still focuses on the first grades of elementary school. Thus, there is a lack of studies exploring strategies to assess and develop cognitive-linguistic skills in preschool.

In this perspective, a study in children from a public preschool verified the effectiveness of an intervention program aimed at developing their cognitive-linguistic skills in this learning stage⁸. It proposed an adaptation of the Protocol for the Early Identification of Reading Problems (IPPL, in Portuguese)⁹ to be used in preschool, as no other such instrument had been published in Brazil. The study results demonstrated that the adapted instrument was sensitive to discriminate between preschoolers with better and worse performances, also identifying preschoolers at risk of learning disorders⁸, however, the study⁸ in question tested the instrument in only one public school, and it would be important to use it in other educational settings.

Given the above, this study aimed to investigate the cognitive-linguistic performance of preschoolers from different educational contexts.

METHODS

This research was approved by the originating institution's Human Research Ethics Committee of the Federal of Pernambuco University, Brazil, under evaluation report no. 4.148.247 and CAAE 14630719.0.0000.8807.

The methodological process indicated for this research was a quantitative analysis, and the study was characterized as descriptive, correlational, and cross-sectional.

Participants

The sample comprised 39 preschoolers aged 4:0 to 5:11 years old, enrolled in preschool. Data were collected in the following two institutions: a private school (middle class) with 20 participants from Recife, Pernambuco, Brazil; and a private school (higher middle class) with 19 participants from Teresópolis, Rio de Janeiro, Brazil.

Participants were selected by convenience. The exclusion criteria were children whose parents did not sign an informed consent form, or who had any syndromic, neurological, and/or sensory changes, such as severe hearing and/or visual problems.

Instruments

Cognitive-linguistic skills were assessed with the Protocol for the Early Identification of Reading Problems⁹, in the version adapted to preschool⁸.

The instrument adaptation required adjustments in test instructions, including new training items, using concrete support material for some tests, excluding or modifying tests that involved phonemic analyses and manipulations, and excluding a word and pseudoword reading test.

Its final version has the following tests: alphabet knowledge (vowels and consonants); metaphonological skills (rhyme production, rhyme identification, syllabic segmentation, word production from initial syllables, syllabic synthesis, initial syllable identification); phonological working memory; rapid automatized naming; silent word reading (choosing among three words the one that represents a figure); and hearing sentence comprehension based on figures.

Procedures

It is important to point out that data were collected after the critical period of the COVID-19 pandemic, between September and October 2020, when resumed in-person classes posed many challenges to schools and faculty.

Initially, personal data were obtained from the students' identification forms at school to contact their parents/guardians. They were sent an information letter with the study objectives, ensuring the participants' confidentiality. Those who agreed to participate in the research signed an informed consent form.

Then, the children were individually assessed in the quietest possible room in the school, during regular school hours. The sessions lasted about 30 to 40 minutes and were recorded and registered in their respective answer protocols.

Data analysis

The cognitive-linguistic skills were analyzed according to the number of correct answers in the protocol⁸. The test is scored by ascribing one point to every correct answer and zero to every wrong or missing answer. The score was divided into three strata to allocate preschoolers into three performance categories: expected, under attention, and at-risk.

The performances of preschoolers from the two institutions were compared with the Mann-Whitney nonparametric test, with the significance level set at 5% ($p < 0.05$).

RESULTS

In general, data revealed that preschoolers from Recife had lower performance indices than those from Teresópolis, with significant differences in the following tests: vowel knowledge, consonant knowledge, rhyme identification, word production, syllable identification, and phonological working memory, as seen in Table 1.

Table 1. Description of the mean and standard deviation of the preschoolers' performances in the adapted protocol tests in two private schools

Test	SCHOOL IN RECIFE (PE, Brazil)	SCHOOL IN TERESÓPOLIS (RJ, Brazil)	MANN-WHITNEY p < 0.05
	Mean (Standard deviation)	Mean (Standard deviation)	
VK	3.79 (1.88)	4.89 (0.31)	0.007**
CK	10 (6.93)	14.15 (4.54)	0.014*
RP	3.5 (6.08)	0.94 (0)	0.068
RI	6.75 (7.60)	12.52 (5.79)	0.004**
SSEG	14.45 (8.79)	17.36 (3.25)	0.089
WP	8.37 (9.08)	15.10 (4.90)	0.002**
SSYN	16.29 (7.59)	16.47 (3.74)	0.462
ISI	13.37 (9.80)	18.89 (4.82)	0.015*
PWM	17 (9.08)	21.31 (1.41)	0.023*
RAN	41.87 (16.88)	44.42 (9.58)	0.289
CAN	34 (2.14)	34.26 (1.72)	0.341
SR	4.28 (3.17)	5.57 (2.38)	0.227
HC	15.78 (6.55)	17.63 (1.21)	0.145

Captions: VK – vowel knowledge, CK – consonant knowledge, RP – rhyme production, RI – rhyme identification, SSEG – syllabic segmentation, WP – word production based on initial phoneme or syllable, SSYN – syllabic synthesis, ISI – initial sound or syllable identification, PWM – phonological working memory, RAN – rapid automatized naming, CAN – correct automatized naming, SR – silent reading, HC – hearing sentence comprehension.

The participants' performances were contrasted with the initial instrument standardization data⁸ and were distributed in the performance categories – expected,

under attention, and at risk of learning problems –, as shown in Table 2.

Table 2. Absolute frequency of preschoolers at risk, under attention, and with expected performance in each test of the adapted protocol

Test	N		EXPECTED		ATTENTION		RISK	
	Recife (PE, Brazil)	Teresópolis (RJ, Brazil)	Recife (PE, Brazil)	Teresópolis (RJ, Brazil)	Recife (PE, Brazil)	Teresópolis (RJ, Brazil)	Recife (PE, Brazil)	Teresópolis (RJ, Brazil)
VK	20	19	14	17	4	2	2	-
CK	20	19	6	9	12	9	2	1
AK	20	19	7	9	11	8	2	2
RP*	20	19	3	-	2	1	15	18
RI*	20	19	2	-	5	12	13	7
SSEG	20	19	8	3	10	16	2	-
WP	20	19	8	11	3	7	9	1
SSYN	20	19	7	2	10	6	3	11
ISI	20	19	13	14	3	4	4	1
PWN	20	19	7	5	12	14	1	-
RAN	15	19	4	5	8	12	3	2
CAN	17	19	11	14	6	4	1	1
SR	20	19	6	8	13	10	1	1
HC	20	19	8	1	9	15	3	3

Captions: N – total number of preschoolers who took the test, VK – vowel knowledge, CK – consonant knowledge, AK – alphabet knowledge, RP – rhyme production, RI – rhyme identification, SSEG – syllabic segmentation, WP – word production based on initial phoneme or syllable, SSYN – syllabic synthesis, ISI – initial sound or syllable identification, PWM – phonological working memory, RAN – rapid automatized naming, CAN – correct automatized naming, SR – silent reading, HC – hearing sentence comprehension.

It was found that most children's results from both schools were expected – i.e., good performance – in vowel knowledge, syllable identification, and number of correct answers in rapid automatized naming. The school from Teresópolis also had expected results in producing words based on initial phoneme or syllable.

Most preschoolers from both schools had under-attention results – i.e., intermediate performances – in consonant knowledge, alphabet knowledge, syllabic segmentation, syllabic synthesis, phonological working memory, automatized naming time, silent reading, and hearing sentence comprehension. Preschoolers from Teresópolis also had such performances in rhyme identification.

Children from both schools had at-risk results – i.e., below the expected – in rhyme production. Those from Recife also had such performances in rhyme identification, while the ones from Teresópolis had so in syllabic synthesis.

It must be highlighted that, in individual analysis, children would be considered at risk only if they performed in this stratum in most of the investigated skills. On the other hand, the collective analysis indicates the most delayed skills, which need greater stimulation in each group.

DISCUSSION

Studies emphasize the importance of monitoring the development of cognitive-linguistic skills since preschool to ensure successful initial learning to read and write^{7,10-12}. This study found that preschoolers performed well or intermediately in some skills, although the results present disturbing data concerning the development of metaphonological skills in preschoolers from both educational settings.

Their low performance in cognitive-linguistic skills may be due to extrinsic factors (especially the lack of good socioeducational opportunities provided by either families or schools), or risk factors for learning disorders¹⁰. On the other hand, the early identification of more delayed skills at school may help guide pedagogical practices to promote their development, minimizing the impact of the children's lack of opportunities at home^{2,5,7}.

It is likewise important to emphasize that the pandemic had great impacts on education, particularly in the initial stages, and remote teaching was related to various factors, such as the students' motivation to learn; their access to the Internet and technological resources; the teachers digital training and competence

to teach in this modality; the methods used to assess students; and so forth¹³.

In the case of this study, the preschoolers' learning may have been further affected, as the development of cognitive-linguistic skills requires a thorough integration of neuropsychological, linguistic, intellectual, emotional, and socioenvironmental processes – which were certainly affected by the social isolation measures implemented during the critical phase of the pandemic¹³.

Hence the poorer performance in rhyme production in both schools in this study may indicate that the stimulation of this metaphonological skill was not given priority in either educational setting. Phonological awareness is considered one of the most important skills to predict successful initial learning to read and write. Studies point out that developing metaphonological skills since preschool can reduce the possibilities of failure in learning to read and write and increase the odds of children's success throughout their school learning process^{2,4,7,14,15}.

Children must be formally taught phonological awareness and other predictive skills, such as knowledge of letters and syllables. These skills are not naturally developed by simply using oral language, so they depend on teaching^{2,4,15}. As previously mentioned, preschoolers in this study performed “under attention” in some of these skills, such as consonant knowledge, alphabet knowledge, syllabic segmentation, syllabic synthesis, phonological working memory, automatized naming time, silent reading, and sentence hearing comprehension.

An international study¹⁶ likewise found disturbing predictive skill results in public schools. It aimed to identify performances in phonological awareness and rapid automatized naming in Ecuadorian preschoolers. The study comprised 100 children from four public schools, assessed with a phonological processing test and a rapid automatized naming test. The results indicated that 31% of the children had difficulties in phonological development and 39%, in rapid automatized naming. Data suggest the importance of implementing strategies and tools to develop these skills and identify early children at risk for learning disorders.

In Brazil, the concern with the development of cognitive-linguistic skills has also motivated changes in education laws and public policies. Thus, the National Curriculum Framework (BNCC, in Portuguese)¹⁷, the document that regulates the essential content to be taught and stimulated in Brazilian schools, presents

32 goals for preschoolers. At least 16 of them refer to language, hearing, verbal, reading, and writing expression and comprehension skills, revealing the concern with preparing children to enter elementary school.

Another important point is that BNCC¹⁷ emphasizes that teachers should follow up on all children's learning individually and as a group, recording their achievements in various ways, such as reports, portfolios, photographs, drawings, and texts, to demonstrate their progress and ensure their learning rights. Monitoring their learning development enables teachers to organize their pedagogical practices and pay even closer attention to the development of preschoolers' predictive skills. Hence, the instrument used in this study may be quite useful to preschool teachers and professionals, as its application in different contexts revealed aspects that need greater stimulation in both populations, respecting the peculiarities of each scenario.

The National Literacy Policy (PNA, in Portuguese), established by Decree no. 9.765, of April 11, 2019, aimed to foment programs and actions to teach reading and writing based on the most recent scientific evidence, grounded on neuroeducation principles. PNA recognizes the importance of preschool to raise the quality of Brazilian education, especially that of literacy¹⁸. It also admits that, despite the greater access to preschool in the country in the last years, many children still do not learn as expected for their age and education level. Moreover, this problem was certainly aggravated by the restrictive measures imposed by the COVID-19 pandemic.

This study applied the Protocol for the Early Identification of Reading Problems in the version adapted to preschool in two different educational settings. The results identified children at risk, under attention, and with expected performance in the different skills assessed by the test. Therefore, it can be recommended as a screening instrument, enabling schools to better direct pedagogical actions for this target public and identify early children at risk for learning disorders.

Using standardized instruments is greatly important to assess schoolers and preschoolers, as they make it possible to compare their performance in different contexts. Given the relevance of early childhood to children's global development and that most studies on language involve this age group¹⁹, it can be inferred that interventions focusing on them can potentialize

their development. Further studies are needed to unveil the best practices to develop such important skills for children's future development.

An article¹⁰ aimed at discussing and understanding cognitive processes and brain mechanisms involved in learning to read and write in alphabetic systems highlights that pedagogical strategies supported on oral language can be used to help develop metalinguistic skills. Other studies likewise observed the benefits of applying a phonological awareness intervention program for preschoolers^{8,11}.

For instance, the comparison of results before and after an educational intervention conducted in research⁸ showed advancements in most skills assessed after the intervention – which ratifies the idea that these skills can and should be stimulated since preschool⁷. Thus, identifying early the factors that contribute to perceived difficulties and developing strategies to stimulate delayed skills can positively help and prepare preschoolers to begin learning to read and write¹⁵.

It must be highlighted that further studies must give priority to preschool to find new assessment and intervention possibilities to monitor and develop cognitive-linguistic skills.

CONCLUSION

This study revealed similarities and differences in preschoolers' cognitive-linguistic performances in different educational settings, suggesting that these performances reflect the different educational opportunities they had. Therefore, the development of these skills must be monitored to guide pedagogical practices at school and enable teaching approaches that help develop cognitive-linguistic skills early in preschool.

REFERENCES

1. Brasil. Lei 12.976/13, 20 de dezembro de 1996. Estabelece as diretrizes e bases da educação nacional, para dispor sobre a formação dos profissionais da educação e dá outras providências. Brasília. Available at: http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/lei/l12796.htm. Acesso em 10 de maio de 2022.
2. Amorim ANGF, Dias NM, Albuquerque EXDS, Silva VCD, Falcão ACGP, Guerra VGR et al. Initial reading and writing skills ins childhood education: achievement sample in the Northeast of Brazil for obtaining specific regional performance standards. *Rev. CEFAC.* 2019;21(5):11. <https://doi.org/10.1590/1982-0216/201921513219>.
3. Santos RS, Francisco GCP, Lukasova K. Expressive and receptive vocabulary in preschool children and socioeconomic factors. *Rev. CEFAC.* 2021;23(6):e5921. <https://doi.org/10.1590/1982-0216/20212365921>.

4. León CABR, Almeida Á, Lira S, Zauza G, Pazeto TDCB, Seabra AG et al. Phonological awareness and early reading and writing abilities ins early childhood education: preliminary normative data. *Rev. CEFAC*. 2019;21(2):e7418. <https://doi.org/10.1590/1982-0216/20192127418>.
5. Silva CD, Capellini SA. Correlação de habilidades cognitivo-linguísticas de escolares submetidos a intervenção fonológica. *Revista Psicopedagogia*. 2021;38(117):305-16. <https://doi.org/10.51207/2179-4057.202100262>.
6. Schoenel ASP, Escarce AG, Araújo LL, Lemos SMA. Influence of phonological processing on poor school performance: systematic literature review. *CoDAS*. 2020;32(5):e20180255. <https://doi.org/10.1590/2317-1782/20192018255>. PMID: 33174983.
7. Sargiani RA, Maluf MR. Linguagem, cognição e educação infantil: contribuições da psicologia cognitiva e das neurociências. *Psicol. Esc. Educ.* 2018;22(3):477-84. <https://doi.org/10.1590/2175-35392018033777>.
8. Queiroga BAM, Capellini SA. Relatório técnico final de estágio de Pós-doutorado Sênior (PDS). Marília- SP: CNPq; 2020. Processo nº 157281/ 2018-3.
9. Capellini SA, Cerqueira Cesar ABP, Germano GD. Protocolo de Identificação Precoce dos Problemas de Leitura - IPPL. Ribeirão Preto: Book-Toy, 2018.
10. Machado MSM, Maluf MR. How reading comprehension evolves in elementary school students. *Psic. da Ed.* [journal on the internet], 2019; [accessed 2022 out 12]; 1(49):57-66. Available at: <https://doi.org/10.5935/2175-3520.20190019>.
11. Santos MJ, Barrera MJ, Domingos S. Impacto do treino em habilidades de consciência fonológica na escrita de pré-escolares. *Psicol. Esc. Educ.* [journal on the internet]. 2017 [accessed 2022 out 12]; 21(1):93-102. Available at: <https://doi.org/10.1590/2175-3539201702111080>.
12. Leite RCD, Brito LRMD, Martins-Reis VDO, Pinheiro ÂMV. Consciência fonológica e fatores associados em crianças no início da alfabetização. *Rev. psicopedagog.* [journal on the internet]. 2018 [accessed 2022 out 12]; 35(108):306-17. Available at: <http://pepsic.bvsalud.org/pdf/psicoped/v35n108/06.pdf>.
13. Freitas VM, Silva CMS. A Educação no contexto da pandemia de COVID-19: uma revisão sistemática de literatura. *Revista Brasileira de Informática na Educação-RBIE*. [journal on the internet]. 2020 [accessed 2022 out]; 28:1013-31. Available at: <http://dx.doi.org/10.5753/rbie.2020.28.0.1013>
14. Córrea KCP, Machado MAMP, Hage SRV. Skills for the literacy process. *CoDAS* [journal on the internet]. 2018 [accessed 2023 out 13]; 30(1):e20170039. Available at: <https://doi.org/10.1590/2317-1782/20182017039>. PMID: 29513870.
15. Rosal AGC, Cordeiro AAA, Roazzi A, Queiroga BAM. Cognitive-linguistic performance of schoolchildren in the literacy cycle in the public school context: universal screening. *Rev. CEFAC*. [journal on the internet]. 2020 [accessed 2022 out 13]; 22(3):1-12. Available at: <https://doi.org/10.1590/1982-0216/20202239919>.
16. Ortega VAE. Conciencia fonológica y velocidad de denominación en niños pre escolares de escuelas públicas. [dissertation on the internet]. Azuay: Universidad del Azuay; 2022. [accessed 2022 out 13]. Available at: <http://dspace.uazuay.edu.ec/handle/datos/11595>.
17. Brasil. Ministério da Educação e Cultura. Base Nacional Comum Curricular. Educação Infantil e Ensino Fundamental. 2017. Recuperado em 10 outubro 2022. Available at: <http://basenacionalcomum.mec.gov.br/wp-content/uploads/2018/02/bncc-20dez-site.pdf>.
18. Brasil. Ministério da Educação. Secretaria de Alfabetização. Política Nacional de Alfabetização (PNA). 2019. Recuperado em 14 outubro 2022. Available at: http://portal.mec.gov.br/images/banners/caderno_pna_final.pdf.
19. Walker D, Sepulveda SJ, Hoff E, Rowe ML, Schwartz IS, Dale PS, Bigelow KM. Language intervention research in early childhood care and education: A systematic survey of the literature. *Early Childhood Research Quarterly*. [journal on the internet]. 2020 [accessed 2022 out 13]; 50(1):68-85. Available at: <https://doi.org/10.1016/j.ecresq.2019.02.010>.

Authors' contributions

BAMQ: research conceptualization, formal analysis, and original draft writing;

AGCR: investigation and original draft writing;

TB, JKOM: investigation;

SAC: research conceptualization, supervision, review, and editing.