Original articles

Expressive and receptive vocabulary in preschool children and socioeconomic factors

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ABSTRACT

Purpose: to assess the expressive and receptive vocabulary of preschool children and trace the relationship with different socioeconomic factors.

Methods: 108 children, aged between 4 and 6 years, were evaluated, 84 from a public preschool and 24 from a private preschool, using the following instruments: CMMS - Columbia Mental Maturity Scale; ABFW; Peabody Image Vocabulary Test (PPVT); CONFIAS – Phonological Awareness: Sequential Assessment Instrument; Rapid Automatic Naming Test (NAR); Questionnaires for the definition of economic classification, general health and family habits. For statistical analyses, the non-parametric Kruskal-Wallis test, Bonferroni post hoc corrections to check significant differences and Spearman correlation were used.

Results: the results found showed a statistically significant relationship between factors such as salary range, mother's and father's education and performance on tests of receptive and expressive vocabulary and mental maturity.

Conclusion: evidence showed the relationship of socioeconomic factors with language development in preschoolers.

Keywords: Language Development; Socioeconomic Factors; Vocabulary

INTRODUCTION

Language can be considered a basic human skill that differentiates human beings from other animals, being pointed out as a system of rules and signals used for communication purposes[1]. It can be defined at different levels, such as phonetics and phonology, that describe the sounds of the spoken language; semantics, that is focused on word meanings; syntax, dedicated to grammar rules and ability to combine words, in order to create sentences; and pragmatics, which is configured as the use of language appropriate to a given context[1,2]. At all levels, language development takes place through the child's interaction with the external environment in different periods of childhood, starting even before birth, mainly, at the phonetic and phonological level.

Language development has shown a strong dependence on the social environment, and also on the development of a highly complex neurobiological apparatus that facilitates the interpretation of sounds (phonemes) in words[1]. Kandel et al.[3] point out that language processing involves neural networks which are distributed throughout the brain and cover distinct areas with nodes, such as: basal ganglia, involved in the formation and construction of sentences; Broca's area participating in the construction of words and sentences and verbal mediating phonetic processing; Wernicke's area and auditory cortex taking part in the acoustic-phonetic mapping.

Several studies have shown that the course of language development is a predictor of academic performance and is easily related to the acquisition of specific skills, such as reading and writing. Thus, children who show good verbal skills in the development from 1 to 8 years old have better and faster acquisition of reading and writing, as well as perform better in elementary school[2,4,5]. Among the different levels of language, studies mainly investigate the semantic aspect and indicate that the acquisition and expansion of expressive and receptive vocabulary are essential for the development of academic skills. Furthermore, among the skills related to reading and writing, the phonological awareness is also included. Phonological awareness can be understood as ability set of skills that allow us to manipulate syllables and sounds of spoken words, being an aptitude that influences and is related to properties of the reading and writing processes[6].

Moreover, the socioeconomic status (SES), should be considered as a highly relevant factor, since several studies have shown that the difference between children from high and low-income families is already evident at 18 months of age, and for example, 3-year-old children in low-income families seems to know approximately 600 words less than the high-income ones. Over time, this disparity only tends to increase. Beyond that, in Brazil, there are studies that indicate a lower vocabulary level than expected in preschool children, with evidence for an association between SES, parents' education and children's performance[7-10].

That said, this study aimed to assess the expressive and receptive vocabulary of preschool children and its relationship with different socioeconomic factors.

METHODS

Children and their caregivers were invited to voluntarily participate in the project through contact with their legal guardians. All parents or legal guardians of participating children signed an Informed Consent Form, approved by the Ethics and Research Committee (Protocol 077_2016) of Cruzeiro do Sul University, Brazil. A total of 108 children aged between 4 and 6 years were evaluated, 84 from a public preschool and 24 from a private preschool. Table 1 describes the grades, mean age and the number of females and males in the study.

Table 1. Number of children evaluated divided by sex and preschool grade groups

School type	N	Females	Males	Groups	Age (M)	SD
Public	84	39	45	Grade1 Pub	5	1.51
				Grade2 Pub	6	0.98
Private	24	15	9	Grade2 Priv	5.7	1.43

Captions: M = Mean; SD = Standard-deviation; Pub = Public School; Priv = Private School

All children whose parents showed interest and willingness to participate in the study were included, but data from participants who met the following exclusion criteria were not considered in the analysis of results: 1. Presence of sensory (auditory and visual) and motor deficits incompatible with normal language development (based on information provided by the school). 2. History of neurological disorders, sleep disturbance, prematurity, impulsivity, tics and attention-related disorders (based on information provided by parents and school). Parents or legal guardians through a questionnaire provided an information on general health, pre- and postnatal development and SES.

Following instruments were used for the assessment of the cognitive skills:

- CMMS (Columbia Mental Maturity Scale)[11] assess the logical reasoning ability. In this test, the child is required to establish a logical relationship between different objects or symbols and to point out the one that does not obey this relationship. The images are presented on 92 boards organized in 8 scales of different difficulty. The subject is scored for pointing out correctly the odd one out figure, which makes the use of the CMMS feasible even in children with language delay. Application took on average 20 to 25 minutes and the raw test score was used for the analyses.

- ABFW is a children's language battery for the phonology, vocabulary, fluency and pragmatics[12]. Only the expressive vocabulary subtest was used, which consists of 9 semantic categories: clothes, animals, food, transport, furniture, objects, professions, places, shapes and colors. The child should name aloud 118 colored pictures presented one by one on individual cards and the assessment took on average 10 to 15 minutes The number of correct answers was computed

- Peabody Picture Vocabulary Test (PPVT)[13] assesses the ability of receptive vocabulary, that is, to understand a word and recognize a corresponding picture. It consists of 130 screens of 4 images that are presented to the subject at the same time as the target word is spoken and should be pointed out among the images. Correctly pointed out targets are counted as a raw score. The boards are arranged in increasing difficulty and application is stopped after 6 consecutive errors, with the total test duration lasting on average 10 to 15 minutes.

- CONFIAS – Phonological Awareness: Sequential Assessment Instrument[14]. The instrument aims to assess phonological awareness in a comprehensive and sequential way. Two first subtests of the Syllable Level (S) were used, the first being S1 - Synthesis, where a word is pronounced separated into syllables and the child needs to say which word was presented and S2 - Segmentation, where a presented word must be separated into the syllables by the child.

- Rapid Automatized Naming Test (RAN)[15]. The instrument's main objective is to assess the ability of automatic naming. Four boards with 50 stimuli are presented where the child must name, as quickly as possible, a sequence of objects, colors, numbers and letters. The test is in an individual application and takes about 10 minutes to complete, and the score was defined by the number of boards that the individual was able to perform.

- Questionnaire for the definition of economic classification, with the socioeconomic criteria indicated in the update of the distribution of classes of the Brazil Economic Classification Criterion (ABEP)[16], which includes questions about comfort items in the home, goods, educational level of the head of household and access to services.

- A SES questionnaire for the assessment of the general health and family habits was adapted for this study, from Segretin et al.[17]. This study sought to identify predictors of cognitive improvement following the training of preschool children from different socioeconomic backgrounds and on the study of Wehby and McCarthy[18] who evaluated the influences of economic disparity on neurodevelopment in four countries in South America: Argentina, Brazil, Chile and Ecuador. Both studies were based on the Lipina and Posner[19] questionnaire. To sum up, the following variables were grouped: Positive prenatal and Negative prenatal events distinguishing among situations that could have positive or adverse effect on fatal development; Postpartum complications; the household composition; Salary range; Education and age of the child's father and mother; Access to basic sanitation; Free time habits (the total amount of reading, the number of books and reading frequency, the number of toys and games of the child), daily activities, which were divided into individual, collective, didactic activities and household chores.

The children selected for the study were directed to dedicated room provided by the school, where the researchers made a brief rapport and started the

application of tests in the following sequence: Columbia Mental Maturity scale, ABFW, PPVT, CONFIAS and RAN. If the child showed signs of disinterest or tiredness in any of the tests, the application was interrupted and continued at another time. The duration of application of all tests was between an hour and an hour and a half approximately.

Questionnaires were sent by the school to parents to be filled in at home and returned in sealed envelopes to the school. A joint effort was also held by the researchers to invite the parents to fill in the missing data during the evening parents-teacher meeting.

For statistical analysis, data were analyzed using the JASP software version 0.13.1[20] where the Kruskal-Wallis non-parametric test was used with comparison between age groups and SES for test scores (CMMS, ABFW, PPVT, CONFIAS, RAN) and was corrected for multiple comparisons by Bonferroni post hoc test. Spearman's correlation was used to assess the relationships between test scores, mother's and father's education and age, salary range and social class according to the ABEP criteria, time and amount of reading, number of games, toys and other daily activities.

RESULTS

Between groups (considering grade) comparison of the cognitive abilities indicated significant differences in the following tests, all with $p < 0.001$: Columbia ($H[2.105]=25.69$); PPVT ($H[2.105]=22.79$); ABFW ($H[2.105]=20.67$); a CONFIAS subtest ($H[2.104]=24.7$); and total RAN tests performed ($H[2.105]= 21.05$). Bonferroni post hoc corrections showed higher scores on most tests for the second grade of the private preschool when compared to the first and second grade of the public preschool, with $p < 0.01$.

Spearman correlations were performed with each group separately, where in the first grade of public preschool there were correlations between PPVT and ABFW (rho = 0.622); PPVT and RAN (rho = 0.603). In the second grade of the PPVT and ABFW public preschool (rho = 0.492); ABFW and a CONFIAS subtest (rho = 0.563). While in the second grade of private preschool there were correlations between CMMS and PPVT (rho = 0.757); CMMS and ABFW (rho = 0.0662); PPVT and ABFW (rho = 0.801) and PPVT and RAN (rho = 0.602); ABFW and RAN (rho = 0.604), with all correlations mentioned above with $p<0.001$.

Information from the socioeconomic questionnaire was correlated with performance on cognitive tasks using Spearman's correlation for second grades in public and private preschool. The identified correlations are shown in Table 2.

Table 2. Correlations between socioeconomic factors and cognitive performance in all second-grade children in public and private preschools

Correlations	N	Rho	p value
CMMS-PPVT	66	0.494	< .001
CMMS-RAN	66	0.428	< .001
CMMS-Salary Range	38	0.742	< .001
CMMS-Father's Education	36	0.566	< .001
CMMS-Mother's Education	36	0.592	< .001
CMMS-Social Class	37	0.707	< .001
CMMS-Overall Reading	38	0.824	< .001
CMMS-Recreational Games	37	0.550	< .001
PPVT-ABFW	66	0.687	< .001
PPVT-RAN	66	0.418	< .001
PPVT-Salary Range	38	0.651	< .001
PPVT-Father's Education	36	0.525	< .001
PPVT-Mother's Education	36	0.644	< .001
PPVT-Social Class	37	0.555	< .001
PPVT-Overall Reading	38	0.550	< .001
ABFW-RAN	66	0.479	< .001
ABFW-Salary Range	38	0.520	< .001
ABFW-Overall Reading	38	0.501	< .001
ABFW-ConfiasS2	65	0.388	< .001
Salary Range-Father's Education	35	0.723	< .001
Salary Range-Mother's Education	35	0.822	< .001
Salary Range-Social Class	36	0.866	< .001
Salary Range-Overall Reading	37	0.843	< .001
Salary Range-Recreational Games	36	0.684	< .001
Father's Education-Social Class	34	0.744	< .001
Father's Education-Overall Reading	35	0.651	< .001
Father's Education-Recreational Games	34	0.530	< .001
Mother's Education-Social Class	34	0.806	< .001
Mother's Education-Overall Reading	35	0.725	< .001
Mother's Education-Recreational Games	34	0.635	< .001
Social Class-Overall Reading	37	0.763	< .001
Social Class-Recreational Games	35	0.588	< .001

Captions: CMMS = Columbia Mental Maturity Scale - PPVT = Peabody Picture Vocabulary Test - ABFW = Child language test in the areas of phonology, vocabulary, fluency and pragmatics - RAN= Rapid Automatized Naming Test - CONFIAS = Phonological Awareness: Sequential Assessment Instrument
Statistical test: Spearman's Correlation

DISCUSSION

The study aimed to assess the expressive and receptive vocabulary and the relationship with SES in preschool children. The reported results highlight a close relationship among cognitive measures of receptive/expressive vocabulary and mental maturity and factors such as salary range and mother`s / father`s education. This result is consistent with other Brazilian studies and points in the same direction as the study by Araújo, Marteleto and Schoen-Ferreira[9] who assessed receptive vocabulary and concluded that children from lower sociocultural backgrounds may be at higher risk for language development problems.

The results of the present study also found a correlation between receptive vocabulary and availability of children's books at home, which shows that the absence of material to be red may be representative of the lacking reading habits adversely affecting the acquisition of children's new vocabulary. Araújo, Marteleto and Schoen-Ferreira[9] suggest that children with low SES would benefit from interventions implemented by school and targeting development during

early childhood in order to reduce the differences that exist between children coming from less and more privileged backgrounds. Moretti, Kuroishi and Mandrá[10] also used the PPVT to assess children and verified the association between the receptive vocabulary and Social Class, and an expressive vocabulary evaluated by ABFW. Thus, it is possible to understand that SES can influence the receptive and expressive vocabulary when represents an environment with low linguistic variability and few daily activities that are stimulating for language development.

To understand the influences of the SES on the acquisition and development of vocabulary, it's possible to find at study of Moretti, Kuroishi and Mandrá[10] arguing that social class can always be an indicator of physical and material resources to which the child has access, such as free time content, rich cultural and leisure activities. In the present study, it was shown that the Quantity of Games factor highly correlated with cognitive abilities in the Columbia mental maturity test, but not in the vocabulary tests. Along these lines, the aforementioned authors suggest a more precise analysis of risk factors, such as environmental characteristics, communicative interactions experienced and the communicative style that parents use in order to understand environmental deficiencies and define which interventions could be more efficient.

When comparing performance on the PPVT with other language tests, it proves to be efficient and is feasible to be administered in this context and in other studies also showed correlation with other vocabulary tests, present moderate to strong results. It was reported PPVT correlation with expressive vocabulary assessed by the Expressive Vocabulary Test (EVT) or Expressive One-Word Picture Vocabulary Test (EOWPVT) in preschool children with normal development, points to $r=0.75$ and $r=0.84$ respectively[21]. In the Brazilian context, the ABFW test can be used and a review studies, such as that by Carbonieri and Lúcio[22], demonstrated that it is mainly used in the cross-sectional investigations and on clinical populations, such as the one with the developmental disorders. However, few researchers reported its use with children of school age with typical development, as performed in this study, that found an expressive vocabulary, assessed by the ABFW, correlation with the receptive vocabulary, examined by the PPVT, in all analyzed groups.

Santos and Befi-Lopes[23] used the ABFW to evaluate the contributions of expressive vocabulary

on phonological awareness and rapid automatized naming. The authors came to the conclusion that the aforementioned while language skills are predictive of the spelling performance of 4th grade students, the vocabulary performance is predictive of the ability to elaborate the written narrative, and rapid naming skills and phonological awareness more specifically predict syntactic and grammatical performance. Thus, it is in line with the correlations reported here, as the ABFW correlated with the results of a subtest in the CONFIAS and with the RAN.

The performance on language tests can be related to academic outcome and as Dias and Oliveira[4] point out, for the child to have a good academic performance in the first years of elementary school, it is essential that they have a good expressive and receptive vocabulary. The familiarity with words aids the reading acquisition and once the written and spoken form of these words are linked, a faster access to the lexicon is achieved, that is, an internalization of the word, its meaning, its written and spoken form during the process of reading.

Furthermore, Strauss, Sherman and Spreen[21] point out that performance on most vocabulary tests, such as the PPVT, is highly correlated with the intelligence quotient (IQ). The widely used test WISC-III (Wechsler Intelligence Scale for Children) reports in its manual a correlation between the PPVT results and the total IQ ($r=0.9$), Verbal IQ ($r=0.91$) and Execution IQ ($r=0.82$). Also, the IQ highest correlation was with the Verbal Compression Index ($r=0.88$) and the lowest with the Processing Speed Index ($r=0.56$), still being considered a substantial correlation. However, the WISC is an intelligence test that depends on the language factor to be answered, which can bias the correlation, so using a test such as the CMMS is necessary to assess intelligence without the influence of language. It was shown that children from grade 2 from the private preschool had a better performance in the CMMS and when mixed with children of the same age from the public preschool, a correlation between the results of the CMMS tests and the PPVT could be seen. Thus, as a conclusion even in logical reasoning test, a correlation is found with some aspects of language, such as receptive vocabulary and naming.

The study by Malloy-Diniz and Schlottfeldt[24] argued that the CMMS assesses conceptual maturity, being more sensitive to aspects related to general cognition. As a test that assesses the general aptitude of children, the CMMS was used by Capovilla et al.[25] to control the effect of intelligence in preschool children assessed

by the picture naming test and which contributed to showing effects of age on the development of receptive vocabulary. Considering that in the present study the performance in conceptual maturity assessed by the Columbia test showed a difference between the groups and a correlation with most socioeconomic factors, it can be inferred that, just as vocabulary, the conceptual maturity is sensitive to environmental stimulation and should be a part of development studies.

CONCLUSION

To sum up, in this study, evidence was reported showing the relationship of SES with the development of language in children, and based on this assessment, interventions in schools and day care centers shall be proposed as a necessary measure to reduce the differences generated by social inequality.

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