


RECEPTIVE AND EXPRESSIVE VOCABULARY AS A PREDICTOR OF LATER PERFORMANCE IN READING AND WRITING: ANALYSIS IN THE LIGHT OF THE COMPLEXITY PARADIGM¹

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ABSTRACT

This article aims to analyze vocabulary knowledge, both receptive and expressive, as a predictor of early learning of reading and writing. 44 children who were students in the first year of elementary school participated in the research. Data collection was carried out in two stages. The first occurred at the beginning of the school year, when the Vocabulary Test of the ABFW test and the Vocabulary Test by Pictures were applied to evaluate our independent variables. The second stage took place during the school year with the application of the Reading and Writing Test to evaluate performance in our dependent variables. The results, analyzed in the light of the Theory of Complex Adaptive Systems, showed in general that initially the positive and strong correlation ($R\ 0.68 - p < 0.05$ - 1st edition) loses predictive strength as the literacy process occurs ($R\ 0.64 - p < 0.05$ - 2nd edition; $R\ 0.53 - p < 0.05$ - 3rd edition; $R\ 0.41 - p < 0.05$ - 4th edition). In the complex set of variables that influence literacy, vocabulary knowledge can be considered an important predictor of early learning of reading and writing.

Keywords: Receptive vocabulary, Expressive vocabulary, Learning prediction, Reading, Writing.

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INTRODUCTION

This article aims to analyze vocabulary knowledge, both receptive and expressive, as predictors of early learning of reading and writing. The data are analyzed in the light of some aspects of Complex Adaptive Systems, in an understanding that language, as a dynamic system in the process of consolidation, influences and is influenced by a series of extra and intralinguistic variables, in the complex dynamics between organism and environment.

Armonia *et al.* (2015) defines the lexicon as the set of all the words that are available to the subject and the vocabulary as a sample of the individual lexicon, that is, the set of words that are actually used by the speaker/writer in the act of speaking and/or writing. A fairly widespread distinction about vocabulary is receptive *versus* productive mastery of an item, sometimes called passive mastery and active mastery. Armonia *et al.* (2015) states that expressive vocabulary corresponds to the lexicon that can be emitted by the child and can be evaluated by the number of words he produces. The receptive vocabulary, in turn, corresponds to the words that the child is able to understand (FERRACINI *et al.*, 2006, p.126) and, therefore, methodologically it is a little more difficult to evaluate. Still on terminological conceptualization, Nation (2001) defines the use of receptive vocabulary as that when it is possible, when listening or reading, to recover the form of a word and recover its meaning.

Another important relationship that the scientific documentation shows is the strong association between children's vocabulary and language and literacy skills. Research such as that by Biemiller and Slonim (2001) and Walker, Greenwood, Hart and Carta (1994) report that children who enter school with little knowledge of vocabulary often experience difficulties in learning to read and that early vocabulary size predicts later academic success. Sénéchal and LeFevre (2002) conducted a five-year longitudinal study with 168 middle- and upper-class children, in which they explored early experiences of literacy at home, receptive language, emerging literacy skills, and reading performance. The results suggest that children's early exposure to books was related to the development of vocabulary and listening comprehension skills, and that these language skills were directly related to children's reading in the 3rd grade.

There are also several studies that reveal that vocabulary can be considered a good predictor of later reading and writing skills. For example, the study conducted by Shapiro (1990) examined the predictive power of vocabulary with respect to reading and writing, and a positive correlation was observed between children's vocabulary skills and subsequent performance in reading and writing skills. In the study carried out by Scarborough (1991), oral

language and reading tests were applied to 62 children, half of whom had parents and/or close relatives with reading problems. Expressive vocabulary ability was the best predictor of later reading skills assessed at the end of the 2nd year of elementary school. Bandini, Bandini and Neto (2017) conducted a study whose objective was to investigate the correlations between phonological awareness skills, vocabulary, intelligence, concentrated attention and reading in children of low socioeconomic status exposed to a precarious teaching environment. Participants were 111 children from a public school, belonging to socioeconomic classes D and E. The results indicated positive correlations between vocabulary, intelligence, phonological awareness and reading skills. It was found that the relationships between the variables in question are maintained, even in populations of low socioeconomic level, however, the precarious teaching environment can be a limiting factor for the expansion of students' reading ability.

The study by Arango-Tobón *et al.* (2018) aimed to establish the relationships between expressive and receptive vocabulary skills and pre-reading skills in preschool children. There were 106 preschool children and the results indicate that expressive vocabulary explains a greater variance in phonological skills involved in the detection of rhymes and initial sounds of words, important precursors for later learning of reading and writing. Guaresi *et al.* (2017) analyzed the relationship between Phonological and Vocabulary Awareness with the learning of reading and writing in the early grades. 22 children from the 1st year of Elementary School participated, 11 females and 11 males. The results showed that there was a positive and strong correlation between Phonological Awareness and total in reading and writing. On the other hand, the correlation between the variables Vocabulary and total in reading and writing showed a positive and weak score, which suggests that there is a weak influence of vocabulary on reading and writing performance. The study carried out by Ganinho (2019) explored the predictive character of vocabulary, rapid naming and phonological awareness in reading and writing performance in the 2nd year of schooling. A total of 69 children were evaluated and the results show that vocabulary only predicts reading fluency and rapid naming predicts reading fluency and word writing. The results demonstrate the predictive power of vocabulary, rapid naming and phonological awareness in the success of reading and writing in the 2nd year of schooling.

COMPLEX ADAPTIVE SYSTEMS AND THE POTENTIAL TO EXPLAIN LINGUISTIC ASPECTS PRESENT IN THE EARLY DEVELOPMENT OF READING AND WRITING

The expression "Complexity Theory" or Complex Adaptive Systems, as it will be used in this study, is commonly used to describe a scientific and philosophical approach to natural phenomena, includes variable designations, such as the Theory of Complex Systems, Chaos Theory, Self-organization Theory and synergetics, nomenclatures that cohabit peacefully, without systematic differences in their uses (DE BOT, 2017, p. 52). The terminological diversity in this area of study is due to the fact that the approach, or perspective, of complexity emerged in the 1940s and 1950s simultaneously in different disciplines, including biology, physics, and computer science. Today it is a multidisciplinary approach that is applied not only to the exact sciences, but also to the biological sciences and humanities, as well as to economics, sociology, anthropology and linguistics, in the latter in studies of aspects related to Language Acquisition (especially speech and acquisition and learning of additional languages).

The Theory of Complex Adaptive Systems is dedicated to the study of complex systems, namely marked by these characteristics: "dynamic, complex, non-linear, chaotic, unpredictable, sensitive to initial conditions, open, self-organizing, sensitive to feedback and adaptive" (LARSEN-FREEMAN, 1997, p. 142). Complex adaptive systems (hereinafter SAC) are therefore systems composed of multiple diverse elements that are capable of adapting and can evolve over time to exhibit highly complex behaviors (HOLLAND, 1995, p. 6). Adaptation is a process or capability through which systems can change in response to some event within their environment. Self-organization is the idea that global coordination can be the product of local interactions. The principle of self-organization refers to the formation of patterns itself as a result of moments of instability, in other words "it is the spontaneous formation of patterns" (BAIA; CORREIA, 2016, p. 57). The self-organization of the system does not mean the absence of some internal agent that operates for the organization to take place, however, there is an inherent capacity of the system to find patterns through some type of interaction (BAIA; CORREIA, 2016). In other words, there is a natural tendency of the system to self-organize. In the Customer Service, every change generates an adaptation and self-organization of its elements, and this is possible due to the fact that complex systems are sensitive to the *feedback* received. The system is adaptive because it has the ability to learn through experiences. In addition, when the system self-organizes, giving rise to new behaviors, a recurrent process occurs in complex

systems called emergence, in which "what occurs as a result of this change in phase state is something different from what occurred before: a result greater than the sum of its parts and that cannot be explained in a reductionist way, through the isolated analysis of the activity of its constituent parts" (LARSEN-FREEMAN; CAMERON, 2008, p. 59). Larsen-Freeman (2017) highlights this phenomenon, that of the self-organization of the system as a function of recurrent patterns, as one of the most relevant characteristics of complex systems.

Another important concept for customer service is that of an attractor. Lewin (1994) argues that most complex systems exhibit what mathematicians call attractors. Larsen-Freeman and Cameron (2008) define attractors as particular patterns of behavior preferred by the system or as areas in the system's trajectory where it tends to move. Oxford (2017, p. 185) reiterates the definition of attractor states as "a pattern or result in which a system stabilizes over time as a result of its self-organization. It's a state that the system tends to move into over time, and in which it tends to stabilize over a period of time."

Baia (2013) states that the dynamic perspective has been used as a complementary approach in several psycholinguistic studies on language processing and development. Although it is not a theory formulated to explain language alone, its application in the linguistic field is not compromised when it is assumed that processes of change and reorganization tend to be repeated in different types of development (BAIA, 2013, p.31). The author also states that when the Theory of Complex Adaptive Systems is applied to language studies, the development and processes of change of a language are understood as interactive processes in constant relationship with the environment (BAIA, 2013, p.32).

Almeida Júnior and Pelosi (2018) define the characteristics that make language a Complex Adaptive System as follows: 1 – several agents (the speakers/listeners in the speech community) that interact in a dynamic and non-linear way; 2 – the various interactions are based on past and current interactions that jointly feed future linguistic behaviors into constant feedback; 3 – language structures emerge from interrelated patterns of experience, social interaction and cognitive mechanisms (ALMEIDA JÚNIOR; PELOSI, 2018, p. 5-6).

It is in this sense that Larsen-Freeman (2013) points out that the SAC is capable of challenging the conception that language is a static system governed by rules, highlighting that the very use of a language can alter the patterns that characterize it. Thus, Kupske and Alves (2016) highlight the potential of the Theory of Complex Adaptive Systems to shed

light on phenomena inherent to Applied Linguistics, as it opposes that portion of Language Acquisition theories that are deterministic and fail to include dynamics and/or variation in their predictions.

In view of the above and the relevance of the question and the need for further investigations on the variables involved, were the main factors that motivated this research, proposed with the objective of: a) evaluating receptive vocabulary and expressive vocabulary as a possible initial predictor of reading and writing; b) to analyze the collected data from the perspective of the Complex Adaptive System.

METHODOLOGY

This is a descriptive, cross-sectional study of quantitative and qualitative evaluation of data, approved by the Research Ethics Committee of UESB under protocol number 50713115.7.0000.0055 and opinion number 1.530.352. All the participants' guardians signed the Informed Consent Form (ICF) and the participants signed the Informed Consent Form (TALE).

44 children duly enrolled in the first year of elementary school in 2023 participated in the research, 26 of them students from a public school and 18 from a private school. The sample was selected by convenience, according to the children's availability. To include the students in the sample, we used the following criteria: a) students enrolled in the first year of Elementary School; b) be between 6 and 7 years old at the time of enrollment; c) Informed Consent Form signed by the responsible person. The criteria for excluding children from the sample were: a) failure to sign the consent form; b) children over the age determined for their grade; c) existence of some neuropathological condition, such as sensory, motor or cognitive impairment, reported by the school.

Data collection was carried out in two moments. First, at the beginning of the 2023 school year, when the Vocabulary Test of the ABFW test was applied for the evaluation of expressive vocabulary and the Picture Vocabulary Test for the evaluation of receptive vocabulary. The second stage occurred with the application of the reading and writing test to evaluate performance in reading and writing. The first application of the reading and writing test carried out was carried out in April 2023, the second stage held in June 2023, the third stage held in September 2023 and the fourth stage held in December 2023.

For data analysis, the following tools were used on the Jamovi platform: descriptive analysis, with the objective of characterizing the population; correlational analysis, using

Simple Linear Regression, in order to verify the relationship between the variables evaluated.

PRESENTATION AND DISCUSSION OF DATA

With the statistical procedure applied, it is possible to see, in Table 1, the Descriptive Statistics of the variables: a) reading, b) writing and c) total reading and writing of the four applications of the test, d) total expressive vocabulary – referring to the application of the ABFW Vocabulary Test, e) total receptive vocabulary – referring to the application of the USP Vocabulary Test and f) total vocabulary representing the sum of the scores of the two tests vocabulary.

Table 1 - Descriptive Statistics of the variables: reading; writing; total reading and writing; Expressive Vocabulary, Receptive Vocabulary and Total Vocabulary.

	N	Average	Standard error	Median	Standard deviation	Minimum	Maximum
Search. 1	43	9.19	1.135	6	7.44	3	35
Esc. 1	43	6.56	0.663	5	4.35	2	21
BACKGROUND 1	43	15.74	1.771	11	11.62	5	53
Search. 2	43	17.26	1.621	14	10.63	5	40
Esc. 2	43	13.49	1.377	10	9.03	3	37
BACKGROUND 2	43	30.74	2.912	27	19.09	10	75
Search. 3	43	24.91	1.744	27	11.44	5	40
Esc. 3	43	19.84	1.671	17	10.96	5	40
BACKGROUND 3	43	44.74	3.302	43	21.66	10	80
Search. 4	43	32.26	1.480	37	9.71	14	40
Esc. 4	43	25.33	1.447	22	9.49	10	40
BACKGROUND 4	43	57.58	2.795	61	18.33	25	80
Voc. Exp.	43	91.93	1.878	94	12.32	65	114
Voc Rec.	43	57.37	1.135	56	7.44	41	72
ToVoc.	43	149.30	2.790	147	18.30	106	182

Source: from the study.

Leit. 1: Total points obtained in Reading in the first stage of monitoring;
 Esc. 1: Total points obtained in Writing in the first stage of monitoring;
 TLE 1: Sum of the points in Reading and Writing in the first stage of monitoring;
 Leit. 2: Total points obtained in Reading in the second stage of monitoring;
 Esc. 2: Total points obtained in Writing in the second stage of monitoring;
 TLE 2: Sum of the points in Reading and Writing in the second stage of monitoring;
 Leit. 3: Total points obtained in Reading in the third stage of monitoring;
 Esc. 3: Total points obtained in Writing in the third stage of monitoring;
 TLE 3: Sum of the points in Reading and Writing in the third monitoring stage;
 Leit. 4: Total points obtained in Reading in the fourth stage of monitoring;
 Esc. 4: Total points obtained in Writing in the fourth stage of monitoring;
 TLE 4: Sum of the points in Reading and Writing in the fourth stage of monitoring;
 You. Exp: Total points obtained in the expressive vocabulary test
 You. Rec: Total points obtained in the receptive vocabulary test
 ToVoc.: Total points obtained in the sum of the points of the expressive vocabulary test and receptive vocabulary.

Table 1 shows the mean, standard error, median, standard deviation, minimum and maximum in all the variables analyzed. In these results, the difference between a minimum of 5 and a maximum of 53 in the first application, total reading and writing 1, is noteworthy, compared to a minimum of 25 and a maximum of 80 in the fourth application, total reading and writing. This data is important to realize that all children evolved in the process of initial acquisition of reading and writing in the period evaluated. On the other hand, it shows how discrepant are the knowledge in reading and writing of children who arrive for the first year of formal education, in which some do not know the sound values of vowels and, on the other hand, there are schoolchildren who already practically read. It is worth remembering here that when the student reaches around 70 points in the reading and writing test, the conditions are already presented for the student to do an autonomous reading.

Table 2 below shows the correlation coefficients of the expressive vocabulary and total reading and writing in each of the applications of the monitoring test.

Table 2 - Correlation statistics between Expressive and Total Vocabulary in reading and writing of the four monitoring editions

Editions	R	R ²
1st edition <i>April 2023</i>	0.641	0.411
2nd edition <i>June 2023</i>	0.618	0.382
3rd edition <i>September 2023</i>	0.498	0.248
4th edition <i>December 2023</i>	0.357	0.128

Source: from the study.

The result presented in Table 2 shows that there was a positive and high correlation ($R\ 0.641 - p < .001$) for the parameters assumed here between the variables *expressive vocabulary* and *total vocabulary in reading and writing*, in the first monitoring edition. In addition to the correlation being strong, the p-value shows that the result is statistically safe. The R^2 value (0.411) observed allows us to conclude that 41% of the performance in reading and writing in the first edition can be explained by the results of the expressive vocabulary. This result indicates that there is a high influence of expressive vocabulary on reading and writing performance at the beginning of the school year. The data from the fourth stage of the reading and writing test show that there was a positive, but moderate correlation ($R\ 0.357 - p < .001$) for the parameters assumed here between the variables *expressive vocabulary* and *total vocabulary in reading and writing* of the 4th edition. In addition to the moderate correlation, the p-value shows that the result is statistically safe.

The R^2 value (0.128) observed allows us to conclude that 12% of the performance in reading and writing can be explained by the results of the expressive vocabulary in the fourth monitoring stage. This result indicates that there is a moderate influence of expressive vocabulary on reading and writing performance. As a highlight, it is worth noting a decrease in the influence of expressive vocabulary as children advance in the process of initial learning of reading and writing.

Table 3 presents the correlation statistics between receptive and total vocabulary in reading and writing of the four monitoring editions.

Table 3 - Correlation statistics between Receptive and Total Vocabulary in reading and writing of the four monitoring editions

Editions	R	R^2
1st edition <i>April 2023</i>	0.614	0.377
2nd edition <i>June 2023</i>	0.555	0.307
3rd edition <i>September 2023</i>	0.489	0.239
4th edition <i>December 2023</i>	0.432	0.187

Source: from the study.

Table 3 shows that there was a positive and high correlation (R 0.614 - $p < .001$) for the parameters assumed here between the variables *receptive* vocabulary and *total reading and writing* in the 1st monitoring edition. In addition to the correlation being strong, the p -value shows that the result is statistically safe. The R^2 value (0.377) observed allows us to conclude that 37% of the performance in reading and writing can be explained by the results of the receptive vocabulary. This result indicates that there is a high receptive vocabulary influence on reading and writing performance at the beginning of the 1st school year of the literacy cycle. When looking at the results of the fourth application of the reading and writing test, we can observe that there was a positive and moderate correlation (R 0.432 - $p < .001$) for the parameters assumed here between the variables *receptive* and *total vocabulary in reading and writing*. In addition to the correlation being strong, the p -value shows that the result is statistically safe. The R^2 value (0.187) observed allows us to conclude that 18% of the performance in reading and writing can be explained by the results of the receptive vocabulary. These results indicate that there is an initially strong influence of receptive vocabulary on reading and writing performance, but this influence decreases throughout the literacy process.

Table 4 shows the correlation between *the total vocabulary* and *total reading and writing* skills of the four monitoring editions.

Table 10 - Correlation statistics between Total in vocabulary and Total in reading and writing of the four monitoring editions

Editions	R	R ²
1st edition <i>April 2023</i>	0.681	0.464
2nd edition <i>June 2023</i>	0.642	0.412
3rd edition <i>September 2023</i>	0.534	0.285
4th edition <i>December 2023</i>	0.416	0.173

Source: from the study.

These results, both from Expressive and Receptive Vocabulary, show that there is an important general trend: the influence of vocabulary decreases as the literacy process occurs. Initially, there is a strong influence of receptive and expressive vocabulary on reading and writing performance, however, this influence decreases throughout the literacy process: R 0.681 in the first edition, R 0.642 in the second, R 0.534 in the third and R 0.416 in the last. While knowledge of vocabulary predicted 46% of performance in reading and writing, this percentage drops to 17% in the last monitoring.

Like ours, other studies have sought to evaluate the predictive potential of vocabulary for later literacy. It seems to us that there is no consensus in the literature about the predictive power of vocabulary when we talk about the initial development of reading and writing. The relationship between these two variables is significant in some studies (SHAPIRO *et al.*, 1990; SCARBOROUGH, 1991; BANDINI, BANDINE AND NETO, 2017; GARINHO, 2019) and weak and/or less significant than other language skills (GUARESÍ, OLIVEIRA, OLIVEIRA, TEXEIRA, 2017; CAPOVILLA AND DIAS, 2008; REIS FAÍSCA, CASTRO AND PETERSSON, 2010).

Studies such as that of Picolo and Salles (2013) found, as in our study, a moderate relationship between reading and vocabulary. The study investigated the relationship between word and text reading, working memory, intelligence quotient (IQ) and vocabulary in children in the 2nd and 5th grades of public schools. And it was also analyzed which of these skills best contributes to explain reading performance. Analyses were carried out with and without children with below-average IQs. First, 57 children were evaluated on IQ, vocabulary, reading single words, reading comprehension and four working memory tasks. A second analysis was carried out with 47 children, all of whom had average intelligence.

Vocabulary was the best predictor of word and text reading performance than working memory measures in the total sample.

An aspect that differs from the results we found is that many studies do not only use vocabulary as a variable, but also analyze other variables in the linguistic field as possible predictors of the initial learning of reading and writing. For example, the study conducted by Zubrick, Taylor, and Christensen (2015) aimed to estimate the longitudinal predictive relationship between receptive vocabulary state at the ages of 4, 6, and 8 years and literacy performance at 10 years. The authors hypothesized that low language ability predicts delayed literacy, and conducted a large-scale study of 2,316 Australian children to investigate predictive patterns of oral language and literacy skills, identifying risk factors for literacy. The results showed that the association between initial vocabulary and word decoding was consistently significant, but weak. The authors reinforce that the relationship between vocabulary and reading ability is not as clear as the relationship between vocabulary and reading ability.

In a study of German children during early learning to read, from preschool to 2nd grade, Fricke, Szczerbinski, Fox-Boyer, and Stackhouse (2016) compared the predictive power of some literacy precursors, and vocabulary appeared as less important relative to other predictors, such as letter knowledge, rapid naming, and phonological awareness.

Similar research conducted in Brazil by Castro and Barrera (2019) aimed to investigate whether and which emerging literacy skills contribute to early reading and writing skills. As with the results obtained in our research, the authors bring vocabulary as one of the emerging literacy skills significantly correlated with writing and reading words and with reading comprehension, but less important than skills directly related to mastery of the alphabetic code, such as knowledge of letters and phonological awareness.

Ziegler (2010) raises an interesting hypothesis to explain the differences between the studies. According to the author, alphabetic orthographies differ in the transparency of their letter-sound mappings, with English orthography being less transparent than other alphabetic languages. The atypical status of English led these researchers to question the generality of the findings based on English-language studies. To do so, they investigated the role of phonological awareness, memory, vocabulary, rapid naming and non-verbal intelligence in reading performance in five languages: Finnish, Hungarian, Dutch, Portuguese and French. The results of a sample of 1,265 children in the 2nd grade showed that phonological awareness was the main factor associated with reading performance in

each language. However, its impact was modulated by the transparency of the spelling, being stronger in less transparent spellings. Most predictors of reading performance were relatively universal in the alphabetic languages surveyed, although their precise weight varied as a function of transparency.

Regarding the vocabulary variable, the study obtained an interesting result. The data for Finnish orthography, the most transparent writing system, appears to deviate from the standards of other languages in several important ways. First, Finnish was the only writing for which phonological awareness was not the most important correlate of reading performance. Secondly, only Finnish showed strong correlations between vocabulary and reading (ZIEGLER, 2010). This, according to the authors, suggests that in more transparent languages, vocabulary may have a stronger correlation with reading. They warn, however, that this hypothesis needs to be better tested. It is worth noting here that the Portuguese language has a median relationship of transparency (Soares, 2016), even more so the Portuguese language spoken in Brazil, the country of our informants.

Another aspect that draws attention in the data obtained in our research was the decrease in the correlation value of both expressive and receptive vocabulary at each stage of monitoring and, consequently, as the participants advanced in the process of acquisition and learning of reading and writing. The research carried out by Matos (2018) can help us understand the reason for this decrease, since the 95 participants in the study were distributed in three groups, 3rd, 4th and 5th grades. The researcher aimed to identify the extent of the receptive vocabulary of a group of Brazilian children in the Elementary School Early Years and its relationship with reading comprehension. The sample came from a popular school that serves children from families of high socioeconomic status in the city of São Paulo. 95 students from the 1st to the 5th year of elementary school participated. The results indicated that the children had an increasing extension of the receptive vocabulary and the level of reading comprehension, as age and schooling increased. Thus, we understand that the decrease in the potential for predicting vocabulary decreases as the teaching process occurs, since there is the advent of other variables with important determining power for the result of literacy, including the nature of the pedagogical practices adopted by the literacy teacher.

One of the proposals of this work was to analyze the data from the perspective of the Theory of Complex Adaptive Systems. According to Guaresí (2023), verbal language is a complex system because it involves several subsystems and is an adaptive system

because it can handle the equally continuous changes in our ways of living. According to the author,

[...] Verbal language in general, and also reading, shows all the characteristics of a dynamic system, since it is a system that consists of many subsystems and variables involved, both linguistic (e.g., pragmatic, syntactic, lexical, morphological, phonological) and extralinguistic (nature of the language, characteristics of the communication event, sociocultural and biological variables, theological aspects, socio-historical, economic, cultural, aspects related to the development of the species, etc.). All these levels, aspects, and variables are in constant interaction in the world (human environment and things) so that the development of language is possible, whether it is the spoken modality, additional languages, or learning to read and write (GUARESI, 2023, p.33).

The statistical analysis of the data undertaken so far shows that vocabulary is related in an important way to later performance in reading and writing. An important characteristic for the Theory of Complex Adaptive Systems is, on the one hand, the path of radiance and, on the other hand, the path is of relative unpredictability. The collective analysis of the objectives shows the gradient movement in the initial development of reading and writing in which the individual leaves a non-reader and gradually moves towards the condition of reader, in which the individual leaves the condition of non-writer and gradually becomes a writer. Another indication of radiance is the fact that most individuals, this is not a rule, have a higher performance in reading than in writing. According to a principle that understanding comes before production, Scliar-Cabral (2018) argues that in all learning, in order to know how to produce, one must know how to understand. Before speaking, the child must understand what adults say to him and thus begin to master the language, so that he can then say his first words. In this sense, the author argues that without knowing how to read, the child will not be able to understand even what he himself has written (SCLIAR-CABRAL, 2018, p. 258). Our data point to something similar, in general we have a scenario in which most children perform slightly higher in reading than in writing.

The general tendency is for there to be a correlation between reading and writing performance and vocabulary, but there are individuals in whom the course of learning to read and write is not necessarily what was expected, configuring in some students a clearly non-linear path. This conception of constant change approached from the dynamicist perspective shows that development within a complex system is not typically linear to all individuals.

For example, subject AL1 had a vocabulary total of 123, below the average of 149. And the reading and writing performance of this informant was 58, above the average

(45.2). In other words, here is an indication of escape from the general trend that is a reading and writing performance above what is expected for this individual in view of his or her vocabulary quantity. And the opposite was also observed. Subject B2 had a total vocabulary of 154, above the overall average of 149. In relation to this informant, it was expected, therefore, in view of his vocabulary quantity, a performance above the average 45, however this was not what was observed, the individual had a reading and writing performance of 24 correct answers, well below the observed average.

Another important concept in Complex Adaptive Systems is that of the attractor. Attractors, according to Guaresi (2023), are stable states, in which the system tends to pursue and, once conquered, tends to remain stabilized for a certain period. The author also points out that, although they are not necessarily predictable, attractor states are preferable. That is, the system will always be attracted to stable patterns of behavior. Guaresi (2023) hypothesizes the periods of relative stability in the process of consolidating the learning of reading: initially the knowledge of the sound value of the letters; then the knowledge of the sound value of simple syllables; then, syllable reading and, finally, fluent reading.

Of the 43 students evaluated, 25 initially presented between 8 and 12 points, that is, they basically knew the vowels. This corresponds to 58% of the students. In the second edition, the percentage of students with 8 to 12 points is reduced to 17.7%. What draws attention in these data is that several of these 17.7% maintain the same or very close score to the first edition, being in the same teaching contexts as those who evolved to other levels of learning. Individuals B1 and A3, for example, obtained a score of 10 in the first edition of the test and 12 in the second edition. Individuals H2, AV1, BS1 and H3 maintained the same score in both editions, 10 points. In our assessment, this fact is an indication that reinforces that the first period of stability is the knowledge of the name or vowel sounds. The other periods of stability could not be evaluated in the scope of the present study.

Taking into account the data obtained and discussed in this research, the data seem to confirm the fundamentals of radiance and nonlinearity in reading and writing performance. Regarding the attractors, the periods of relative stability in the process of consolidation of learning proposed by Guaresi (2023), our data suggest with some clarity the existence of the first period, which is the period of knowledge of the sound value of vowels. The other proposed periods could not be evaluated with the data of the present study.

FINAL CONSIDERATIONS

The results found in the study highlighted the complexity of the relationship between vocabulary and the initial learning of reading and writing. For us, it has become clear from the results that there is a need for an integrated and comprehensive approach to the study of linguistic variables that predict or not literacy. Taken together, the results suggested that, along with many similarities, there are distinct differences in the ways in which vocabulary is related to the process of early reading acquisition and that it may be further influenced by various aspects such as socioeconomic conditions and the nature of the language being learned.

In view of these results, the hypothesis that expressive vocabulary and receptive vocabulary are an important predictor in the process of initial learning of reading and writing is true, however, their level of correlation changes from strong to moderate as the literacy process occurs, which corroborates the findings of several studies and contributes to research in the field of predictors of initial learning of reading and writing.

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