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Symbolic play, vocabulary and intellectual performance of children with developmental language disorder

Maturidade simbólica, vocabulário e desempenho intelectual de crianças com transtorno do desenvolvimento da linguagem

Keywords

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Descritores

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ABSTRACT

Purpose: To verify whether the performance in the first assessment of pretend play of children with diagnostic hypothesis of developmental language disorder, correlates with the performance in formal tests of non-verbal intellectual function and both receptive and expressive vocabulary after 5 years old. **Methods:** The research comprised 26 subjects, 19 of whom were male, and 7 were female, with an mean age of 4:10. All participants presented a diagnostic hypothesis of developmental language disorder based on inclusion and exclusion criteria described internationally. Data were analyzed in relation to pretend play, vocabulary and performance in standardized intellectual assessment test; we also investigated correlation between them. All data underwent statistical analysis and the confidence intervals were 95%. **Results:** As for pretend play, it was found that most children with suspected developmental language disorder present more primitive symbolic development. Regarding vocabulary, the data show greater performance in receptive vocabulary than in expressive. In the assessment of the intelligence quotient, the children obtained, in their majority, classifications in the mean score and superior score to their age. Regarding the interaction between studied variables, no correlation was found. **Conclusion:** No relationship was found between the studied variables. The data are discussed in the light of international literature and promote important reflections on the symbolic-linguistic development of this population.

RESUMO

Objetivo: Verificar se o desempenho da primeira avaliação da maturidade simbólica de crianças com transtorno do desenvolvimento da linguagem, se correlaciona com o desempenho em provas formais de avaliação da função intelectual não-verbal e vocabulário receptivo e expressivo após os 5 anos de idade. **Método:** A pesquisa foi composta por 26 sujeitos, sendo 19 do sexo masculino, e 7 do sexo feminino, com média de idade de 4:10. Todos os participantes tinham, por ocasião da avaliação inicial, hipótese diagnóstica de diagnóstico de TDL, posteriormente confirmada com base em critérios de inclusão e exclusão descritos internacionalmente. Foram analisados dados em relação à maturidade simbólica, vocabulário e desempenho em avaliação intelectual padronizada e investigada correlação entre eles. Todos os dados passaram por análise estatística e os intervalos de confiança foram de 95%. **Resultados:** Quanto à maturidade simbólica, verificou-se tanto para o jogo mais utilizado, quanto para o mais elaborado, que a maioria das crianças com transtorno de desenvolvimento da linguagem apresentaram jogos mais primitivos. Em relação ao vocabulário, os dados apontam um melhor desempenho em vocabulário receptivo. Na avaliação do quociente de inteligência, as crianças obtiveram, em sua maioria, classificações na média e superior à média. Em relação à interação entre variáveis estudadas, nenhuma correlação foi encontrada. **Conclusão:** Não foram encontradas correlações entre as variáveis estudadas. Os dados são discutidos à luz de literatura internacional e promovem importantes reflexões a respeito do desenvolvimento simbólico-linguístico desta população.

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INTRODUCTION

The development of oral language correlates with a complex series of cognitive, perceptual and linguistic skills whose genesis is in the pre-verbal period. Symbolic construction is part of the cognitive skills essential for the formation of the linguistic sign and consequently the use of words as a form of expression. Thus, the development of symbolism is directly related to that of oral language⁽¹⁾.

It is known that in the process of language development, entry into the symbolic world is a preponderant factor for the child to reach levels of greater linguistic complexity. During this process of child development, there is a great and close relationship between the cognitive, affective, social and communicative areas, which constitute the basis for the emergence of symbols⁽²⁾. The symbolic function consists of the ability to represent the world experienced and lived. It involves, in addition to language and symbolic play, deferred imitation, problem-solving by mental combination of mental actions and images, which constitute a system of signifiers of symbolic and cognitive functions, enabling different forms of representation⁽³⁾.

Different authors highlight the relationship, in typical children, of the skills of symbolic maturity and the further development of language in its different subsystems, relating it, including, to the different stages of the complexity of language skills^(4,5).

Some researchers have stated that symbolic maturity and language skills have their development supported by similar skills, since both depend on the ability to represent and use a representative element of a given object, person, place or action of another element or situation^(6,7). In activities of symbolic maturity, objects or situations are used even if they are not present, similarly to what occurs in a linguistic activity that uses phonological combinations (words) to represent objects, situations, places and events in the real world⁽⁶⁾. In addition, both symbolic maturity and language share similar structures that progress in more elementary ways to progressively complex use and that demand different cognitive skills^(7,8).

Children with Developmental Language Disorder (DLD) have atypical and discrepant development in language skills, in addition to impaired linguistic processing⁽⁴⁾. This atypical development also involves the pre-linguistic skills that make up symbolic maturity and these children tend to have simpler symbolic plays than those seen in their typical peers, as demonstrated by Takiuchi, Befi-Lopes and Araújo⁽⁹⁾.

More recent studies indicate that children with DLD may have other manifestations co-occurring with linguistic deficits, such as: changes in attention, changes in motor speech processing, in addition to cognitive and intellectual ones. Another point that is being discussed again is the change in the characterization of the discrepancy between non-verbal and verbal skills, suggesting that children with non-verbal IQ below the average, which is not less than 70, may be diagnosed with DLD⁽¹⁰⁾.

It is worth mentioning, however, the difficulty in finding materials that assess the cognitive-intellectual skills of children under the age of five, and that are possible for application by the speech-language therapist, which makes the diagnosis process of these children a more arduous task, mainly for the

professional who works in more distant regions, far from the big centers. In this sense, the evaluation of symbolic maturity is of paramount importance in this age group, since in addition to indicating the level of symbolic development of the individual, it is pointed out by some authors as an important skill that relates the development of symbolism and cognitive and intellectual skills⁽¹¹⁻¹⁴⁾.

Thus, considering that performance in assessing symbolic maturity can provide data not only regarding symbolic-linguistic development, but can also be an indicator of intellectual and language functions, it is necessary to investigate how these skills are related. Thus, the present study aimed to verify whether the results of the first assessment of the symbolic maturity of children who entered speech-language therapy with suspected DLD before the age of five and whose diagnosis was confirmed are related to performance in formal assessment tests of non-verbal intellectual function and vocabulary at the age of five.

METHODS

Retrospective cross-sectional study, approved by the Institutional Research Ethics Committee (REC) under no 523.760. Since this was a retrospective study, the free and informed consent form was not necessary.

The research consisted of 26 subjects, 19 of whom were male, and 7 were female, with an average age of 4:10 (years: months). All participants had a diagnosis of DLD based on internationally described inclusion and exclusion criteria: impairment in at least two measures that make up the complete language assessment such as receptive, expressive vocabulary, phonological and verbal Short-Term Memory (vSTM), phonology, morpho-syntax, speech, and obtain an adequate non-verbal intellectual performance in which, according to new inclusion criteria, it covers children with a classification that ranges from much higher to lower^(10,15). The children participating in this study were attended to in the last five years at the Laboratory for Speech-Language Therapy Investigation in Pediatrics of the Speech-Language Therapy course at the Faculty of Medicine of the University of São Paulo.

The symbolic maturity data were collected using the first assessment of the child's symbolic maturity, which frequently occurs in the age group of 3 to 5 years, when the children start to care.

As described by the authors⁽⁹⁾, the assessment of symbolic maturity must be carried out by analyzing the footage, registering the symbolic actions and plays in the corresponding protocol. Each scheme must be numbered and, if sequential symbolic plays occur, they must be separated⁽⁹⁾.

The acts (actions and plays) must be classified according to the stages of the symbolic play: Pre-Symbolic Scheme (PSS) - 1 point: the child recognizes the appropriate use of an object, using brief gestures of recognition; there is no symbolic play yet, it is the properties of the object that elicit the gesture (Ex.: the child puts the phone close to the ear; the child touches the comb in the hair); Auto-Symbolic Scheme (ASS) - 2 points: the child plays by developing actions that are part of his repertoire, demonstrating simulation. The symbolism is directly involved

with the child's body (Ex.: the child pretends to sleep; the child pretends to drink from a toy bottle); Assimilative Symbolic Play (ASP) - 3 points: the child simulates actions with other people, in which their own role is reversed, including other receptors of the action (Ex.: the child feeds the mother; the child combs the doll); Imitative Symbolic Play (ISP) - 4 points: the child simulates actions that are typically associated with other people's activities, playing the role of the other (Ex.: the child pretends to sweep; the child pretends to read a book; the child moves a car toy with vehicle sounds); Object-Substitution Symbolic Play (OSSP) - 5 points: the child plays using substitute objects to perform his actions (Ex.: the child plays on the phone with a spoon; the child eats using a toothpick as if it was a spoon); Single-Scheme Combinatorial Symbolic Play (SCSP) - 6 points: the child applies the same symbolic play scheme sequentially to a series of different agents or objects (e.g., the child feeds the mother, then the evaluator, then the doll); Combinatorial Multi-Scheme Symbolic Play (CMSP) - 7 points: the child applies a sequence of different schemes, related to the same object (Ex.: the child bathes, feeds and puts the doll on the bed).

After the classification, it is necessary to verify which the most elaborated scheme the child presented and which was the most used. Finally, the score is added and recorded in a specific protocol containing the final result in which the maximum score is 14 points.

In turn, the RAVEN's⁽¹⁶⁾ Coloured Progressive Matrix (RCPM) test aims to verify non-verbal intellectual performance. The test consists of a scale that consists of three series of 12 items: A, Ab and B. The items are arranged in order of increasing difficulty in each series, with each series being more difficult than the previous series.

At the beginning of each series, easier items are always placed, the purpose of which is to introduce the child to a new type of reasoning, which will be required for the following items. The items consist of a drawing or matrix with a missing part, below which six alternatives are presented, one of which completes the matrix correctly. The child must choose one of the alternatives as the missing part, allowing the examiner to observe the ability to understand new situations, remember relevant information and the ability to judge and accumulate specialized information.

The children participating in the present study were evaluated by a qualified professional when they reached the age of five. As described in the test manual, the subjects' performance was classified as follows: score 1 for intellectually superior, 2 definitely above average, 3 intellectual average, 4 definitely below average in intellectual capacity and 5 intellectually deficient.

In addition, specifically for this study, in order to better correlate the results of symbolic maturity assessment with the data from the RAVEN's Coloured Progressive Matrix (RCPM) test, a classification and interpretation criterion was developed for the classification of symbolic maturity in relation to the play / most used scheme, most elaborate play/scheme, total score and classification (Chart 1).

For the evaluation of expressive vocabulary, the Vocabulary Test of the ABFW⁽¹⁷⁾ test was used, which is composed of 118 figures divided into nine conceptual fields: clothing, animals, food, means of transport, furniture and utensils, professions, places, colors and shapes, and toys and musical instruments. The child's performance was quantified in: number of correct answers or Usual Word Designation (UWD), number of other forms of appointment other than the correct form or Substitution Processes (SP), and the absence of response or No Designation (ND). For the present study, only the total UWD value for receptive and expressive vocabulary will be considered.

With regard to receptive vocabulary, the test consists of asking the child to point out, among a set of figures, the one that the evaluator nominates. The test has the same semantic fields found in the expressive vocabulary test of ABFW⁽¹⁷⁾.

All data underwent statistical analysis. The value of statistical significance adopted was equal to 5% ($p \leq 0.05$). The SPSS Statistics software, version 25.0 (IBM Corp., Armonk, NY, USA) was used. To calculate the 95% confidence intervals, the corrected and accelerated bias method was used based on 2000 bootstrap samples. The values in square brackets in the tables indicate the upper and lower limits of the 95% confidence intervals.

RESULTS

Table 1 shows the sample distribution according to the type of play most used and the most elaborate play in the symbolic maturity test.

Table 2 shows the measures of central tendency and dispersion of the total symbolic maturity score and the percentage of correct answers in the expressive and receptive vocabulary tests.

Table 3 presents an analysis of the distribution of quantitative data for the study sample. This analysis intended to verify whether the data obey the assumption of normality, in order to assist in the decision of choosing the test for investigating the correlation of these variables (parametric or non-parametric test). The Shapiro-Wilk test was used to verify compliance with the assumption of normality.

As the quantitative variables violated the assumption of normality ($p \leq 0.05$ in the Shapiro-Wilk normality test) and

Chart 1. Grouping of symbolic plays and RAVEN and their respective scores

SCALE OF SYMBOLIC MATURITY	SCORE	RAVEN CLASSIFICATION
ESQ- Auto-Symbolic Scheme (ASS)	1	Much below average
Pre-Symbolic Scheme (PSS)		
IP- Imitative Symbolic Play (ISP)	2	Lower than average
Assimilative Symbolic Play (ASP)		
JR- Object-Substitution Symbolic Play (OSSP)	3	Average
JU- Single-Scheme Combinatorial Symbolic Play (SCSP)	4	Higher than average
JM- Combinatorial Multi-Scheme Symbolic Play (CMSP)	5	Much higher than average

Table 1. Characterization of individuals regarding the most used type of play and the most elaborate play in the symbolic maturity test

Variable	Categories	Absolute frequency (n)	Relative frequency (%)
Most used play	PSS	18	69.23
	ASP	2	7.69
	OSSP	3	11.54
	ISP	2	7.69
	CMSP	1	3.85
Most elaborate play	SCSP	2	7.69
	CMSP	12	46.15
	OSSP	6	23.08
	ASP	1	3.85
	ISP	4	15.38

Caption: PSS: Pre-Symbolic Scheme; ASP: Assimilative Symbolic Alay; OSSP: Object-Substitution Symbolic Play; ISP: Imitative Symbolic Play; CMSP: Combinatorial Multi-Scheme Symbolic Play; SCSP: Single-Scheme Combinatorial Symbolic Play

Table 2. Characterization of the study sample in relation to the total score in the symbolic maturity test and the percentage of correct answers regarding the expressive and receptive vocabulary tests

Variable	n	Average	SD	Median	Min.	Max.
Symbolic maturity - Total score	26	8.08 [7.04 – 9.19]	2.80	7.50 [6.00 – 8.00]	5.00	14.00
Receptive vocabulary (%)	26	82.55 [78.76 – 85.39]	8.12	84.29 [82.15 – 85.36]	50.00	93.20
Expressive vocabulary (%)	26	58.81 [51.42 – 65.81]	18.37	59.16 [55.08- 69.02]	0.00	88.98

Caption: SD: Standard Deviation; Min.: Minimum; Max.: Maximum

Table 3. Analysis of the distribution of quantitative data for the study sample

Variable	Test statistics	Shapiro-Wilk
		p-value
Symbolic maturity - Total score	0.884	0.007*
Receptive vocabulary	0.754	< 0.001*
Expressive vocabulary	0.902	0.018*

*Statistically significant value at the 5% level ($p \leq 0.05$)

Table 4. Correlation analysis between symbolic maturity, the Raven's test and the vocabulary test

Var.		Raven's test	Receptive vocabulary	Expressive vocabulary
Symbolic maturity - Most used play	Coef.	0.128 [-0.241 – 0.452]	0.110 [-0.242 – 0.461]	-0.025 [-0.465- 0.424]
	<i>p</i>	0.533	0.592	0.903
Symbolic maturity - Most elaborate play	Coef.	0.023 [-0.372- 0.431]	-0.178 [-0.601- 0.247]	0.005 [-0,415- 0,442]
	<i>p</i>	0.912	0.385	0.980
Symbolic maturity - Total score	Coef.	0.052 [-0.346 – 0.436]	0.124 [-0.283- 0.493]	0.142 [-0.313- 0,589]
	<i>p</i>	0.802	0.547	0.488
Symbolic maturity - Final classification	Coef.	0.063 [-0.307 0.423]	0.142 [-0.258- 0.534]	0.070 [-0.358- 0.498]
	<i>p</i>	0.761	0.489	0.732

Spearman's correlation test

Caption: Coef.: Coefficient

as the other variables have an ordinal qualitative nature, only non-parametric tests were used to investigate the correlations.

Table 4 shows the correlation analysis between symbolic maturity, the Raven test and the vocabulary test. For this analysis, the correlation coefficient and the *p*-value were calculated using Spearman's correlation test (non-parametric). In all analyzes performed, no statistically significant linear correlations were observed.

DISCUSSION

Considering the performance in symbolic maturity, it was possible to observe both for the most used play, as well as the most elaborate and for the possible combinations between these two plays that the majority of children with suspected DLD arriving at the speech-language therapy clinic, present more primitive plays, which do not involve the representation of

their actions with the object, with a poor ability to abstract and perform make-believe (pretend play). These data indicate that these children are symbolically much lower than the average, showing the strong relationship that this skill has in relation to language development, since all children presented changes in the level of expression and linguistic reception^(11,18).

Regarding vocabulary, the data in the present study indicated a better performance of children with DLD in receptive vocabulary, as verified by different authors^{17,18}. Studies point out that, in general, children with language disorders have a delay in the development of the first words and failure in vocabulary expansion, difficulties in acquiring abstract concepts and in combining the meanings of the words to form sentences^(17,18).

As for RAVEN, the children in the present study obtained, for the most part, non-verbal intelligence ratings on average and higher than average. In some cases, a classification below the average was observed, which, according to the new diagnostic criteria described internationally, allows the inclusion of these children in the diagnosis of DLD^(10,19). Liao et al. when studying cognitive development in children with language disorders, observed the heterogeneity of this picture regarding verbal IQ and performance IQ. Their results showed that the IQ of these children was significantly lower than in children without changes, and pointed out that the delay in the development of language skills may be linked to the delay in the development of mental capacity⁽²⁰⁾.

Through this, it is up to the professional to know the intellectual skills of their patients to arrive at a more reliable diagnosis, which will provide better planning of interventions, in addition to important information about the prognosis in children with developmental problems⁽¹⁰⁾. This becomes even more imperative when considering that more recent studies show that children with DLD may show variations in intellectual function and even in the score of nonverbal IQ, a fact that can contribute even more to the heterogeneity of manifestations already observed and described in this population, which can have important repercussions not only in the diagnosis, but also in the therapeutic direction⁽¹⁰⁾.

Regarding the correlation between the symbolic maturity and RAVEN tests, it was expected that, through the symbolic maturity data, it would be possible to infer about the future performance of non-verbal intelligence of children with DLD, however, this was not observed. A possible hypothesis for these results is that the non-correlation between the variables is due to the fact that they are skills with different bases, that is, the symbolic skills are directly related to linguistic tasks and those measured by Raven are of a non-verbal order. On the other hand, the literature⁽²⁰⁾ shows that when the inverse relationship is analyzed, that is, if language skills influence cognitive potential, there are studies with significant correlation. In addition, this same study⁽²⁰⁾ showed evidence that the delay in the development of language skills may partially explain the delay in the development of intellectual abilities, even when the delay is considered within the normal range of IQ.

It is noteworthy that different authors⁽²¹⁻²³⁾ have already stated that the relationship between cognitive and language development and the phases of acquisition that the child goes through to

effectively build his/her knowledge, show us that language and cognition seem related at specific points in development. Thus, language acquisition could not be understood in isolation in child development. Its emergence has close relations with cognitive aspects and suggests that language development depends on the development of cognition⁽²⁴⁾.

Regarding the correlation between symbolic maturity and vocabulary, it was shown to be weak in the subjects of this study, with a slight tendency of association only between the most elaborate symbolic play and the expressive vocabulary skills. Similar results were observed in the studies by Quinn et al.⁽²⁵⁾ who conducted a meta-analysis involving more than 6325 subjects, in which relationships between symbolic maturity and different language subsystems were identified, pointing to a strong correlation with vocabulary. However, differently from the results found in the present study, the authors observed greater interactions between symbolic maturity and receptive vocabulary.

Lee et al.⁽²⁶⁾, when describing the results of the correlation between symbolic maturity and language in children with alterations in this area, showed that this population shows different behavior with regard to these skills when compared to their typical peers. The results found in the children of the present study reinforce these data when we could observe the weak correlation between symbolic maturity and vocabulary. The authors discuss the different variables that can interfere in this relationship, emphasizing that to achieve symbolic maturity properly, a capacity for symbolic abstraction and representation is required, which is usually impaired in these children. The authors also emphasize the need for further studies involving the investigation of these skills in children with alterations in language development^(27,28).

It should also be noted that the international literature indicates that the lower the child's age, the greater the chance of observing a correlation between symbolic maturity and linguistic development. This may be a reason that explains the low correlation found in the present study since the assessment of symbolic maturity occurred in children over three years of age and, some of them, already four years old⁽²⁹⁾.

It is also important to note that different international studies have pointed out that, for typical children, the association between maturity and vocabulary is very common, however, some researchers report not having found such a correlation^(4,29,30). The authors describe several factors that can influence such diverse results in the literature and mention that one of the greatest difficulties is the very evaluation of symbolic maturity that occurs in different ways and also involves the subjectivity of the evaluator. In addition, they cite a small number of studies of this nature involving children with language disorders.

Therefore, this study contributes consistently by indicating the need to further investigate the relationships between cognitive-intellectual, symbolic and linguistic skills in order to provide data that can improve not only assessment methods, but also therapeutic procedures that can be developed for children diagnosed with DLD. In addition to the inclusion of a control group, a larger sample is suggested, to establish a parallel between children with and without DLD with regard to symbolic and linguistic skills, as these are probably limitations of the present study.

CONCLUSION

No relationship was found between performance in symbolic maturity, vocabulary and non-verbal intellectual skills of children with a diagnostic hypothesis of DLD. These data promote important reflections regarding the symbolic-linguistic development of this population, pointing to the need to study them more deeply and in parallel with their typical peers in order to improve the knowledge of the symbolic-linguistic development.

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Author contributions

JBAM: collection, data tabulation and data analysis, initial writing of the article; *CCS*: data collection, tabulation and analysis; *AJCS*: data analysis, initial writing and article review; *DMLB*: project design, writing of the final version and revising the article.