Original articles

Listening and reading comprehension and syntactic awareness in reading and writing disorders

Compreensão oral e leitora e consciência sintática nas alterações de leitura e escrita

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Conflict of interest: non-existent

ABSTRACT

Purpose: it was investigated deficits in syntactic awareness in students with learning disabilities and were analyzed correlations between these reading and listening comprehension skills.

Methods: 29 children were assessed, nominated by their teachers for not having any academic learning problems - Group I (GI) and with oral and/or writing communication disabilities, who formed the Group II (GII). The children's ages fluctuated from 9 years to 11 years and seven months and they were in fourth and fifth grade of elementary school. The assessment was composed by listening comprehension tests, syntactic and morphosyntactic awareness, reading average and accuracy and reading comprehension. Were used for the statistical analysis: non-parametric Mann-Whitney test for sample characterization and comparison of patients with and without problems and Spearman's correlation coefficient, used to measure the degree of association between the variables in each group.

Results: were observed significant differences between the groups. Listening and reading comprehension, syntactic and morphosyntactic awareness in general, average and accuracy of reading tests were better in GI.

Conclusion: these results show the importance of stimulating metasyntactic skills to reading development and the inclusion of metasyntactic tests in the reading assessment, as well as the use of related activities as a therapeutic resource.

Keywords: Reading; Learning; Language; Speech, Language and Hearing Sciences

RESUMO

Objetivo: investigar a presença de déficits de habilidades metassintáticas em escolares com dificuldades de aprendizagem e analisar possíveis correlações entre essas habilidades e as de leitura e a compreensão oral.

Métodos: foram avaliadas 29 crianças, indicadas por seus professores, por não apresentarem queixas relacionadas à aprendizagem escolar - Grupo I (GI) e com queixas de comunicação, oral e/ou mediada pela escrita, que constituiram o Grupo II (GII). As idades das crianças variaram entre 9 anos e 11 anos e 7 meses, de 4º e 5º ano do Ensino Fundamental. As crianças foram avaliadas por meio de testes de compreensão oral, consciência sintática e morfossintática, taxa e acurácia de leitura e compreensão leitora. Para a análise estatística foram utilizados: teste não paramétrico de Mann-Whitney, para caracterização da amostra e comparação dos grupos com e sem queixa escolar quanto às variáveis, e Coeficiente de correlação de Spearman, usado para medir o grau de associação entre as variáveis em cada grupo.

Resultados: observaram-se diferenças significantes entre os grupos, nas tarefas de compreensão oral, consciência sintática e morfossintática, de maneira geral, taxa e acurácia de leitura e na prova de compreensão leitora, com melhor desempenho do do GI em todas as tarefas.

Conclusão: com estes resultados, enfatiza-se a relevância da estimulação de habilidades metassintáticas para o desenvolvimento da leitura e a inclusão de provas metassintáticas na avaliação da leitura, tanto quanto a utilização de atividades metassitáticas como recurso terapêutico.

Descritores: Leitura; Aprendizagem; Linguagem; Fonoaudiologia

INTRODUCTION

The literature has highlighted emphatically the relationship between the development of oral language and the learning and development of reading and writing[1]. Until now, most of the researches about reading have been grounded in the assumptions and hypothesis of the Simple View of Reading[2], in which the outcome of the reading is to understand what is being read. In this view, there is a conflict of development between two components of the oral language: one, related to components of phonological information, that enables phoneme-grapheme association and learning of the alphabetical principle; and the other, related to lexical-semantic and morphosyntatic development, which is necessary for oral or written comprehension. However, reading can also be understood as a complex activity that requires the development of linguistic abilities, which support automatic processing of information, and metalinguistic, which allows the speaker to think about a language, making it as an object of reflection[3]. Linguistic abilities, which are unconscious and unintentional, are learned naturally, while metalinguistic abilities are intentional, conscious, and monitored, and usually must be explicitly taught in order to be fully developed[4]. Appropriate linguistic and metalinguistic development are essential for the development of reading and writing and therefore for success in school. Therefore, underlying presence of deficits of components and/or oral language functioning are to be expected the when learning disabilities are observed.

Phonological[4-7] and morphosyntactic awareness are the metalinguistic abilities that matters for the reading and writing. These abilities allow the speaker to reflect on the syntactic structure of the oral language [4,5,8-11], and losses of that metacognitive ability may be associated with deficits in reading and writing. The former is related to changes in literacy and the latter to low values of reading rate and accuracy[1,12], among other problems. The relationship between phonological awareness and the learning of the alphabetic code is well known, and it appears to be a universal feature[4-7]. The perception of the segmented nature of speaking allows the speaker to identify the sound, after which mental representation, based on auditory memory information, can construct the letter perceived visually. Although smaller segments than words can be perceived in pre-school ages (in other words, the perception is oral and not written), this association needs to be taught formally in elementary school.

Like morphosyntactic awareness, studies have shown a positive correlation between performance in syntactical awareness and the subsequent performance in reading[4,13-16] and writing[15] mainly of words with orthographic irregularities, videlicet, that can't be read correctly with the exclusive use of decodification or phonological rote. Another important aspect of syntactical awareness for reading and writing is the use of grammatical clues for the understanding of sentences and texts[17,18]. As happens in the relation between writing and phonological awareness, there are other elements of the language that cannot be observed by school age speakers: for example, the perception of words and sentences as grammatical elements and not just as meaning holders. In the same way as with phonological awareness, the relation between the written language and syntactical awareness seem to be reciprocal; episyntactical behavior in kindergarten predisposes students to success in learning reading which in turn promotes development of reflection on syntax[19].

Therefore, besides its contribution to word recognition, the capacity to reflect about syntax is essential for the understanding of the text. The grasp of meaning depends not only on the sum of the meanings of the individual lexical elements, but also on the form that those elements articulate syntactically. In the same way as phonological phonemic information, the grammatical elements of speeches can be observed as objects of analysis. This capacity, like other metalinguistic abilities, is associated with the ability to monitor reading comprehension[17]. The automation of grammatical performance and the perception of the syntactical and morphosyntactic components must show correlation with the level of comprehension of the text read[20].

It is important to recognize children with this disability and get to know their characteristics to avoid them soon, even before they begin the reading and writing learning. The hypothesis that students with deficits or difficulties in reading and writing can show deficits of syntactical awareness guided this study.

The aims of the present study are to investigate the presence of deficits of metasyntactic abilities in students identified by their teachers as having with learning difficulties, and to analyze positive correlations between those abilities and reading and oral comprehension.

METHODS

This research followed the guidelines for prospective transversal studies and it was developed at the Speech Therapy Department, São Paulo Medicine School/

Federal University of São Paulo – EPM/UNIFESP – São Paulo (SP), Brazil. The study was approved by the Ethics Research Committee of UNIFESP/EPM, CCAE 49351215.6.0000.5505.

The sample was composed of 29 children identified by their teachers. Group I (GI) had no concerns related to school learning. Those with concerns about their oral or written communication composed Group II (GII). All of them were recruited in one São Paulo city elementary school in the second semester of the school year of 2015.

Group I was composed of 15 children (10 girls and five boys) and GII of 14 children (seven girls and seven boys) in the fourth and fifth years of elementary school. The children's ages varied from 9 years old to 11 years and 7 months old (average = 126 months).

The following general criteria were used to select participants for inclusion in the sample: regular registration in the fourth or fifth year of public elementary school and absence of evidences of sensory deficits, neurological diseases and/or psychiatric or complaints and indicators of any of these conditions. The children who joined the study fit the criteria for inclusion. The children's guardians signed the Terms of Free and Enlightened Consent. The school also signed the Terms of Institutional Consent.

Procedures

The teacher responsible for both groups was interviewed for the collection of data, including information about the presence or absence of any concern related to speaking, language, reading, writing or hearing. After being selected, according to this indication and the observance of the inclusion criteria, the participants were evaluated by the following tests:

- **Test of oral comprehension:** the text "The Vultures and the Pigeons,"[21,22] a story without illustrations, composed with 14 elements. Those are distributed in three episodes, each with an introduction, development and an ending. The examiner told the story. After hearing it, the student answered orally eight open-ended questions that were asked orally about the text.
- **Oral reading:** the children were instructed to read a text ("The owl and the eagle" for the fourth year students and "The little greaser" for the fifth year students) out loud, as fast and correctly as they could. The reading was recorded for the calculation of rate values (words/minute) and accuracy (words read correctly/minute).

- **Reader comprehension:** the children received an explanatory text "The anteater,"[23] and, after they had read it, they answered 14 open-ended questions asked them orally. Those questions allowed evaluation of literal comprehension, interference by textual cohesion, and of gap filling[24,25]. The answers were recorded and transcribed for analysis.
- **Test of Morphosyntactic awareness**[26]**:** This test was composed of two subtests: a) Composition, comprising five items, that demand verbal or number and gender flexion starting from the word stem; b) Decomposition, comprising 14 test items, that required the student to identify the word stem starting from the derived word. In both subtests, the words were presented orally in sentences.
- **Test of Syntactic Awareness (PCS)** [27]**:** This test was composed of four subtests, containing 55 items in total: a) Grammatical Judgment (JG), evaluated the student's ability to judge grammatically. b) Grammatical Correction (CG) evaluated the student's ability to correct ungrammatical sentences, making them correct. c) Grammatical Correction of Sentences with Grammatical and Semantics errors (FA) evaluated the student's ability to listen to sentences with both syntactical and semantic anomalies and repeat the sentences correcting the syntactical anomalies, but keeping the semantic anomalies. d) Categorization of words (CP) evaluates the student's ability to classify in three columns adjectives, nouns, and verbs, 15 words written in files.

The complete assessments took on average 30 minutes for each child and were made individually, on a schedule and in a room indicated by the administrators and teachers of the school.

The results were classified according to the scoring of each test and tabulated for statistical analysis.

Statistical method

The non-paramedic test of Mann-Whitney was used for the description of the sample and comparison of the variables for the groups with and without school disabilities. Spearman's Coefficient of Correlation was used to measure the level of association between the variables in each group.

The significance was found to be $p < 0.05$.

RESULTS

Significant differences were observed between the groups' performance on each test (Table 1). In the oral comprehension tasks, (p=0.023), Group I had a better performance on every task: Grammatical Judgment (JG); Sentences with Grammatical and Semantics errors (FA) and Categorization of Words (CP); general PCS (p<0.001); composition subtest of Morphosyntactic Awareness test (p<0.001); rate and accuracy of reading (p<0.001); and reading comprehension (p<0.001).

The subtest of Grammatical Correction of PCS showed no difference between the groups (p=0.112). The decomposition subtest of the Morphosyntactic Awareness test also showed no any difference between the groups (p=0.051), with very similar results.

The correlations between the variables have shown significant differences in each group, as hoped. In the group without concerns (GI), some variables have shown positive correlations, from moderate to large (Table 2). The comprehension test correlated with the Grammatical Judgment subtest of PCS. The Categorization of Words subtest of PCS correlated to the values of the rate and accuracy of reading. The rate and accuracy of reading correlated to reading comprehension.

Positive correlations were also found in the group with concerns (GII) (p<0.05). However, no correlations appeared among reading variables or oral comprehension and performance on Morphosyntactic Awareness tests. The results of the subtests of the Morphosyntactic Awareness test, composition and decomposition, correlated with each other and with the overall score of PCS. Reading rate and accuracy correlated with reading comprehension.

DISCUSSION

In the investigation of the characteristics of reading abilities, metasyntactic awareness and oral comprehension, the group of students identified by their teachers with learning difficulties showed the poorest performance. Group II had the lowest values of rate and accuracy of reading (Table 1), which showed that the teachers involved in the research correctly identified students with reading difficulties, according to the literature[28].

Metalinguistic deficits related to syntactic awareness usually show association to losses of orthographic learning (both for writing and reading) and should be expressed as low values of reading accuracy. In this study, the comparisons between GI and GII showed lower accuracy of reading by students with learning concerns. These students also made more mistakes in the tasks that evaluated syntactic awareness, except the task of Grammatical Correction, in which both groups showed similar performance. Simple grammatical correction does not seem to have been a difficult task even for the students with learning difficulties. The same result was observed in the morphosyntactic decomposition task, which was probably easier to perform than the composition items of a word from a given root[26].

In a general way, it is possible to think that the lowest accuracy values can be associated with syntactic losses at the metalinguistic level. However, only in GI, the group without concerns, did the analysis indicate the presence of moderate positive correlations between one of the variables of syntactic awareness, the Word Categorization, and the reading rate and accuracy, as expected (Table 2). That is, the syntactic correct answers in categorizing words, the faster and more accurate was the oral reading. These results corroborate previous studies[4,13-16] that demonstrate a positive correlation between performance in syntactic awareness and the subsequent performance in reading. No correlation was found between the syntactic awareness and reading accuracy in the group with concerns, which seems to show that the loss of syntactic awareness does not allow these students to that skill as students without concerns do in this age range[4,13,15,16]. The performance profile of GII allowed us to observe the presence of strong positive correlations only between variables of the same type.

In GI, on the other hand, it was possible to observe correlation between a few variables of different language dimensions. The Oral Comprehension Test correlates with the PCS's Grammatical Judgment subtest. This correlation can be explained by the hypothesis that metalinguistic skills stem from the development of oral language and promote the learning of the alphabetic code and the acquisition and reading and writing development. That is, these conditions are results of the characteristics of language development (linked to cognitive mechanisms of low cognitive order) as well as high-order cognitive metalinguistic skills[3].

The results of this study also showed that children with learning disabilities reported by the teacher showed worse performance in the reading comprehension test. The hypothesis is that both main forms of language knowledge that support comprehension,

Table 1. Comparison of scores of groups GI (without cocerns) and GII (with concerns)

		Group		Mann-Whitney (p)	Result
		GI	GII		
ORAL COMPREHENSION	Average	0,88	0,71	0,023*	GI > GII
	Median	1,00	0,75		
	DP	0,22	0,24		
	N	15	14		
PCS – Grammatical Judgment	Average	1,00	0,93	<0,001*	GI > GII
	Median	1,00	0,95		
	DP	0,01	0,05		
	N	15	14		
PCS – Grammatical correction	Average	0,91	0,81	0,112	GI = GII
	Median	0,90	0,85		
	DP	0,10	0,16		
	N	15	14		
PCS – Sentences with Grammatical and Semantics Errors	Average	0,95	0,74	<0,001*	GI > GII
	Median	1,00	0,80		
	DP	0,08	0,17		
	N	15	14		
PCS – Categorization of words	Average	0,96	0,68	<0,001*	GI > GII
	Median	1,00	0,73		
	DP	0,05	0,24		
	N	15	14		
PCS - Total	Average	52,93	43,64	<0,001*	GI > GII
	Median	54,00	42,50		
	DP	2,31	6,16		
	N	15	14		
PCMS - Decomposition	Average	0,96	0,81	0,051	GI = GII (almost significant)
	Median	1,00	0,80		
	DP	0,08	0,20		
	N	15	14		
PCMS - Composition	Average	0,92	0,76	0,012*	GI > GII
	Median	0,93	0,86		
	DP	0,09	0,18		
	N	15	14		
RATE	Average	124,04	66,63	<0,001*	GI > GII
	Median	124,61	68,03		
	DP	24,62	20,80		
	N	15	14		
ACCURACY	Average	119,49	55,33	<0,001*	GI > GII
	Median	122,30	55,80		
	DP	25,66	21,41		
	N	15	14		
READING COMPREHENSION	Average	0,57	0,20	<0,001*	GI > GII
	Median	0,53	0,10		
	DP	0,20	0,22		
	N	15	14		

* Statistically significant values (p< 0,05) – Mann-Whitney Test (p)
Legend: N = Number of subjects; PCS = Syntactic Awareness Test; PCMS = Morphosyntactic Awareness Test; DP = Standart Deviation

Table 2. Correlation between the variables of the group without cocerns (GI)

		ORAL COMP	PCS-JG	PCS-CG	PCS-FA	PCS-CP	PCS-TOTAL	PCMS-DECOMP	PCMS-COMP	RATE	ACCURACY	READING COMP
ORAL COMPREHENSION	Correlation	1,000										
	Sig. (p)	.										
	N	15										
PCS- Grammatical Judgment (JG)	Correlation	,516(*)	1,000									
	Sig. (p)	0,049	.									
	N	15	15									
PCS- Grammatical Correction (CG)	Correlation	0,066	0,458	1,000								
	Sig. (p)	0,814	0,086	.								
	N	15	15	15								
PCS- Sentences with Grammatical and Semantics Errors (FA)	Correlation	0,327	0,500	0,366	1,000							
	Sig. (p)	0,234	0,058	0,179	.							
	N	15	15	15	15							
PCS- Categorization of words (CP)	Correlation	0,359	0,459	0,285	,554(*)	1,000						
	Sig. (p)	0,189	0,085	0,304	0,032	.						
	N	15	15	15	15	15						
PCS- TOTAL	Correlation	0,206	0,453	,752(**)	,755(**)	,745(**)	1,000					
	Sig. (p)	0,461	0,090	0,001	0,001	0,001	.					
	N	15	15	15	15	15	15					
PCMS- DECOMPOSITION	Correlation	0,046	-0,134	0,061	-0,089	-0,110	-0,061	1,000				
	Sig. (p)	0,871	0,635	0,829	0,752	0,696	0,830	.				
	N	15	15	15	15	15	15	15				
PCMS- COMPOSITION	Correlation	0,059	0,386	-0,011	-0,148	0,102	-0,125	0,201	1,000			
	Sig. (p)	0,835	0,155	0,970	0,598	0,718	0,656	0,473	.			
	N	15	15	15	15	15	15	15	15			
RATE	Correlation	0,273	0,062	-0,064	-0,045	,537(*)	0,193	-0,116	0,407	1,000		
	Sig. (p)	0,326	0,827	0,820	0,872	0,039	0,492	0,681	0,132	.		
	N	15	15	15	15	15	15	15	15	15		
ACCURACY	Correlation	0,247	0,062	-0,034	-0,045	,537(*)	0,211	-0,154	0,362	,993(**)	1,000	
	Sig. (p)	0,375	0,827	0,904	0,872	0,039	0,450	0,583	0,184	0,000	.	
	N	15	15	15	15	15	15	15	15	15	15	
READING COMPREHENSION	Correlation	0,438	0,311	-0,192	0,149	0,203	0,039	-0,233	0,365	,614(*)	,616(*)	1,000
	Sig. (p)	0,103	0,259	0,494	0,595	0,468	0,892	0,404	0,181	0,015	0,015	.
	N	15	15	15	15	15	15	15	15	15	15	15

(*) Statistically significant values (p< 0,05) – Spearman Correlation
Legend: N = Number of subjects; PCS = Syntactic Awareness Test; PCMS = Morphosyntactic Awareness Test

semantics (related to the meanings of words) and grammar (the ability of combined morphemes to convey a meaning) can show deficits associated to the reading and writing[1,29]. Other studies also emphasize the importance of the use of grammatical hints to the comprehension of sentences and texts[17,18]. Although expected, at least in GI, positive correlations between the reading comprehension tests and syntactic proofs were not found in either of the groups.

In both groups, reading rate and the accuracy correlated with reading comprehension. The relationship of speed and reading precision to information comprehension is known and widely studied[2,30].

However, in a general way, it is possible to affirm that both groups differ in their performance on oral and reading comprehension tests and of metasyntactic awareness, but possible restrictions of analysis imposed by the size of the sample should be observed.

CONCLUSION

The group with concerns (GII) showed underperformance to GI both in metasyntactic tasks and in reading and oral comprehension. Only the group without difficulties showed association between metasyntactic awareness tasks and reading rate and accuracy. These results emphasize the importance of stimulating metasyntactic skills to the development of reading and the inclusion of metasyntactic tests in the assessment of reading, as well as the use of metasyntactic activities as a therapeutic resource.

Table 3. Correlation between the variables of the group with cocerns (GII)

		ORAL COMP	PCS-JG	PCS-CG	PCS-FA	PCS-CP	PCS-TOTAL	PCMS-DECOMP	PCMS-COMP	RATE	ACCURACY	READING COMP
ORAL COMPREHENSION	Correlation	1,000										
	Sig. (p)	.										
	N	14										
PCS- Grammatical Judgment (JG)	Correlation	0,509	1,000									
	Sig. (p)	0,063	.									
	N	14	14									
PCS- Grammatical Correction (CG)	Correlation	0,430	,644(*)	1,000								
	Sig. (p)	0,125	0,013	.								
	N	14	14	14								
PCS- Sentences with Grammatical and Semantics Errors (FA)	Correlation	0,052	0,250	,705(**)	1,000							
	Sig. (p)	0,860	0,389	0,005	.							
	N	14	14	14	14							
PCS- Categorization of words (CP)	Correlation	0,329	0,530	0,427	-0,053	1,000						
	Sig. (p)	0,251	0,051	0,128	0,856	.						
	N	14	14	14	14	14						
PCS- TOTAL	Correlation	0,487	,663(**)	,812(**)	,541(*)	,611(*)	1,000					
	Sig. (p)	0,078	0,010	0,000	0,046	0,020	.					
	N	14	14	14	14	14	14					
PCMS-DECOMPOSITION	Correlation	0,473	0,244	0,141	0,033	0,286	0,355	1,000				
	Sig. (p)	0,087	0,400	0,630	0,910	0,321	0,213	.				
	N	14	14	14	14	14	14	14				
PCMS-COMPOSITION	Correlation	0,325	0,246	0,498	0,167	0,299	,617(*)	,610(*)	1,000			
	Sig. (p)	0,256	0,397	0,070	0,569	0,299	0,019	0,021	.			
	N	14	14	14	14	14	14	14	14			
RATE	Correlation	-0,018	0,192	0,137	0,162	0,441	0,364	0,309	0,142	1,000		
	Sig. (p)	0,951	0,512	0,641	0,581	0,114	0,200	0,282	0,629	.		
	N	14	14	14	14	14	14	14	14	14		
ACCURACY	Correlation	0,083	0,291	0,034	-0,132	0,528	0,294	0,293	0,092	,916(**)	1,000	
	Sig. (p)	0,777	0,313	0,909	0,652	0,052	0,308	0,309	0,754	0,000	.	
	N	14	14	14	14	14	14	14	14	14	14	
READING COMPREHENSION	Correlation	0,097	0,431	0,433	0,013	0,493	0,391	0,261	0,412	,660(*)	,718(**)	1,000
	Sig. (p)	0,740	0,124	0,122	0,966	0,073	0,167	0,368	0,143	0,010	0,004	.
	N	14	14	14	14	14	14	14	14	14	14	14

(*) Statistically significant values (p< 0,05) – Spearman Correlation
Legend: N = Number of subjects; PCS = Syntactic Awareness Test; PCMS = Morphosyntactic Awareness Test

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