

# A PRELIMINARY INVESTIGATION ON LANGUAGE ASSESSMENT OUTCOME IN DYSARTHRIA

## *Resultados preliminares do estudo da compreensão em sujeitos disártricos*

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### ABSTRACT

**Purpose:** to study language comprehension in dysarthric subjects. **Method:** a retrospective, descriptive and qualitative-quantitative study involving 60 subjects, age ranging from 40-70 years. Data crossing was carried out including sub-tests of comprehension of: spoken words (SWC), written words (WWC), spoken simple phrases (SSPC), written simple phrases (WSPC), spoken complex phrases (SCPC) and written complex phrases (WCPC). **Results:** the higher the SWC, the higher the WWC; the higher the SSPC, the higher the WSPC, and vice-versa; the higher the WC, the higher the PC; the higher the SPC, the higher the CPC, and vice-versa. No associations with age, gender, SCPC and WCPC were observed. **Conclusion:** both comprehension and difficulty in comprehension are associated with the degree of complexity of the linguistic structure.

**KEY WORDS:** Comprehension; Language; Dysarthria; Stroke

### ■ INTRODUCTION

Communication is a dynamic process which comprises various dimensions, involving context and subject. Under this perspective, the brain functioning for language, audition, speech production, motor coordination of phonoarticulatory organs and laryngeal movements, among other tasks, includes factors which directly affect the viability and quality of the communication.

Dysarthria is a neuromotor speech disorder which comprises a group of motor speech disorders resulting from a muscular control impairment of the speech mechanisms derived from central or peripheral nervous system lesion. Many etiological factors affect the speech motor control of brain: degenerative diseases, cerebral vascular accident, head trauma, neuroinfections, surgical trauma,

some congenic conditions, such as the Moebius syndrome, drug poisoning, among others. <sup>1</sup>

Dysarthria is characterized by impaired speech intelligibility, poor voice quality and hypernasality, depending on the lesion location. Unlike aphasia, good lexical access and appropriate conditions for structuring sentences are preserved in dysarthria, besides the written language comprehension<sup>1-4</sup>

Dysarthria covers the processes of phonation, resonance and articulation of speech sounds; Is a set of disturbances on the aspects of strength, speed or coordination of the peripheral muscles of speech. As motor impairment, however, has not been studied from the point of view of language comprehension by dysarthric subjects, or studies related to her privilege speech understanding by the dysarthric subject (s) is (s) correspondent (s) <sup>5</sup>.

Comprehension may be impaired when there are alterations in the semantics and morphology of the spoken word, such as verbs, substantives, pronouns, adjectives, prepositions, conjunctions and articles, as well as in the ability of reading comprehension of sentences and texts<sup>6</sup>

In view of these, we propose reflection over more comprehensive description of aspects of language comprehension in dysarthric subjects as

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an indicative factor for a differential diagnosis and rehabilitation prognosis in the realm of dysarthrias.

Therefore, the purpose of this paper is to present a study on language comprehension in dysarthric subjects

## ■ METHOD

### Retrospective, descriptive, qualitative and quantitative study

The study carried out in two phases. In the first, patient records with dysarthria condition, registred and selected at the Rehabilitation Service of the Physiatic Department of Santa Casa de Misericórdia de São Paulo, with language assessments performed between April 2007 and June 2007, were analyzed. In the second phase, the subjects were selected from both sexes, age ranging between 40 to 70 years old, with language assessment, including Montreal Toulouse Tests (alpha version).

From the Data Bank, the following Montreal Toulouse test battery was selected: 1) guided interview; 2) spoken comprehension of words and simple and complex phrases; 3) written comprehension of words and simple and complex phrases. These procedures, described in the protocol of the test answers, were registered in patients' medical records.

For analysis of the assessment, the crossing of the following data was performed:

- spoken/oral word comprehension (WC) with written word comprehension (WWC)
- spoken/oral simple phrase comprehension (SPC) with written simple phrase comprehension (WSPC)
- spoken/oral complex phrase comprehension (CPC) with written complex phrase comprehension (WCPC)
- spoken/oral word comprehension (WC) with spoken/oral simple phrase comprehension (SPC)
- spoken/oral word comprehension (WC) with spoken/oral complex phrase comprehension (CPC)
- spoken/oral simple phrase comprehension (SPC) with spoken/oral complex phrase comprehension (CPC),
- written word comprehension (WWC) with written simple phrase comprehension (WSPC)
- written word comprehension (WWC) with written complex phrase comprehension (WCPC)
- written simple phrase comprehension (WSPC) with written complex phrase comprehension (WCPC)

Due to their regular attendance at the Speech Therapy Department of Irmandade de Misericórdia

da Santa Casa de São Paulo, a signed consent form was already obtained from each individual, including the employment of language tests to be analyzed in this study.

This study was approved by the Ethics Committee of FCMSCSP (project 389/07).

The following non-parametric tests were used for data analyses: Spearman Correlation Test, Friedman Test, Wilcoxon Test, Mann-Whitney Test and Kruskal-Wallis Test. The significance rate applied was 5% and the statistically significant value are marked bold and with an asterisk.

## ■ RESULTS

Thirty one dysarthric subjects were selected of whom one abandoned the study before its completion.

The dysarthria classification was not possible due to incomplete medical records.

Table 1 shows the results of Spearman Correlation Test for dysarthria. In this table, one can check the values of the correlation coefficient ( $\rho$ ) and its significant level (p-value).

The correlation coefficient values show the strength of the relation between two variables: 0 – 0,25 = very low; 0,26 – 0,49 = low; 0,50 – 0,69 = moderate; 0,7 – 0,89 = high; 0,9 – 1,00 = very high <sup>7</sup>.

The data from table 1 show that all variables are interrelated; the relation between spoken word comprehension and written word comprehension is the lowest, and between the written simple phrase comprehension and written complex phrase comprehension is the highest.

Thus, we can state that:

- WC is significantly associated with all other tasks/ tests, this relation is high for SPC, moderate for CPC and WSPC and WCPC; and low for WWC.
- SPC is significantly related to all other tasks/ tests, this relation is moderate for WSPC and WCPC; and low for WWC and CPC.
- CPC is significantly associated with all other tasks/tests, this relation is moderate for written comprehension battery.
- WWC is significantly association with all other tasks/tests, this relation is high for WSPC and WCPC;
- WSPC and WWC are significantly related, this relation is high.

Table 2 shows the comparative results between spoken and written comprehension of words and simple and complex phrases. There was a significant difference among all items of comprehension of sentences, WCPC < CPC < WSPC < SPC

**Table 1 – Spearman Correlation for the comprehension battery**

rho (p-value)	WC	SPC	CPC	WWC	WSPC	WCPC
WC	1.000 (-)					
SPC	<b>0.708</b> ( <b>&lt;0.001*</b> )	1.000 (-)				
CPC	<b>0.609</b> ( <b>0.001*</b> )	<b>0.484</b> ( <b>0.009*</b> )	1.000 (-)			
WWC	<b>0.417</b> ( <b>0.027*</b> )	<b>0.475</b> ( <b>0.011*</b> )	<b>0.565</b> ( <b>0.002*</b> )	1.000 (-)		
WSPC	<b>0.616</b> ( <b>&lt;0.001*</b> )	<b>0.570</b> ( <b>0.002*</b> )	<b>0.577</b> ( <b>0.001*</b> )	<b>0.794</b> ( <b>&lt;0.001*</b> )	1.000 (-)	
WCPC	<b>0.502</b> ( <b>0.007*</b> )	<b>0.520</b> ( <b>0.005*</b> )	<b>0.641</b> ( <b>&lt;0.001*</b> )	<b>0.759</b> ( <b>&lt;0.001*</b> )	<b>0,872</b> ( <b>&lt;0.001*</b> )	1.000 (-)

Legend: WC: Word comprehension, SPC: Simple phrases comprehension, CPC: Complex phrases comprehension, WWC: Written words comprehension, WSPC: Written simple phrases comprehension, WCPC: Written complex phrases comprehension.

**Table 2 – Comparison of written and spoken words and phrases**

	Dysarthrics		
	S	p-value	Wilcoxon
words	5.00	<b>0.025*</b>	
phrases	29.98	<b>&lt;0.001*</b>	CPC ≠ CPC ≠ WSPC ≠ WCPC

Legend: WC: Word comprehension, SPC: Simple phrases comprehension, CPC: Complex phrases comprehension, WWC: Written words comprehension, WSPC: Written simple phrases comprehension, WCPC: Written complex phrases comprehension.

Table 3 shows the comparative results between the comprehension battery and gender. In a general way, the sex was not determinant with the exception of an isolated variation which was that women presented better comprehension of spoken complex phrases than men.

**Table 3 – Gender comparison**

	M	p-value
WC	0.55	0.458
SPC	0.25	0.619
CPC	4.62	<b>0.032*</b>
WWC	0.60	0.439
WSPC	0.92	0.337
WCPC	1.00	0.316

Legend: WC: Word comprehension, SPC: Simple phrases comprehension, CPC: Complex phrases comprehension, WWC: Written words comprehension, WSPC: Written simple phrases comprehension, WCPC: Written complex phrases comprehension.

Spearman Correlation Test was applied for each comprehension task in order to verify whether the

increase of age improves or worsens performance (table 4).

**Table 4 – Spearman Correlation – effect of age**

rho (p-value)	dysarthric
WC	-0.167 (0.414)
SPC	-0.346 (0.084)
WWC	0.039 (0.697)
WWC	-0.080 (0.697)
WSPC	-0.064 (0.756)
WCPC	-0.156 (0.448)

Legend: WC: Word comprehension, SPC: Simple phrases comprehension, CPC: Complex phrases comprehension, WWC: Written words comprehension, WSPC: Written simple phrases comprehension, WCPC: Written complex phrases comprehension.

No significant linear relation among the batteries was observed. In spoken simple phrase comprehension, a trend of performance decrease with aging was noted.

## ■ DISCUSSION

The literature shows the importance of the accuracy when evaluating these data relates size and topography of the lesion with the influence positive or negative trends in speech and language of aphasic after 72 hours of first ischemic episode. Some studies report that, the smaller the size of the lesion, the greater are the chances of developing into a severe case of dysarthria, others, however, suggest a lack of direct correspondence between lesion topography and dysarthria<sup>8,9</sup>. The study in focus, provided the possibility to diagnose which subjects had dysarthria, a more precise classification of the type of dysarthria was not, however, possible as the data from the medical records were incomplete.

Comparing spoken and written modalities, it was observed that the higher the WC and SPC, the higher the WWC and WSPC; and the other way round also occurs. No correlation with SPC was possible. In the comparison of spoken comprehension, it was observed that the higher the WC, the higher the SPC and vice-versa; and the higher the SSPC, the higher the CPC and vice-versa. Regarding to the comparison in written comprehension, the higher the WWC, the higher the WSPC, and vice-versa; and also the higher the WSPC, the higher the WCPC, and vice-versa. Correlations with comprehension of complex phrases were not possible.

In the case of complex oral and written sentences, there was no correlation for complex sentences. No data were found in the literature that compared oral comprehension and writing. The data corroborate the wordings of the literature regarding the lack of homogeneity in the responses of test comprehension of sentences in patients with acquired neurological disorders, especially in aphasics<sup>10</sup>.

The literature points out to the data in aphasic comprehension of passive sentences in which it was found degraded performance and heterogeneity. The authors of these studies suggest that some difficulties in understanding reflect the demand of the processors used in linguistic analysis of syntax, regardless of clinical classification of afasia<sup>8</sup>. In a study on understanding and / or production of negative sentences in aphasic British, Germans and Norwegians with agrammatism, there was no significant difference in comprehension when compared affirmative with negative phrases<sup>11</sup>.

Saygin et al, dedicated to study linguistic and nonlinguistic stimuli, and found that the subjects' performance was demoted and suggested that key areas for production are also related to the comprehension<sup>12</sup>. It was observed in another study that the temporal lobe, the temporal junction frontal-parietal

and posterior areas are involved in naming and understanding tasks<sup>13</sup>. Other authors argue that the reconstruction and improvement of production and comprehension of language (linguistic factors and non-linguistic) can be related<sup>14, 15</sup>. This study did not use additional language measures for testing the lexical-semantic system. These data are, however, important for the assessment and differential diagnosis of aphasia and in dysarthric patients. In addition, the study did not test non-linguistic skills, for example, working memory and executive functions, because they were not the focus of the study.

It was also evident in the literature that, in severe cases of aphasic comprehension, low scores can occur in both scores and multidimensional as in hit and error<sup>16</sup>.

There are reports that the intelligibility of speech is one aspect that affect the communicative effectiveness of the subject, so the literature suggests the use of argumentative and additional strategies as an additional resource to the communication used to aid listening comprehension of speech<sup>17</sup>.

When correlated to understanding and gender of the subjects, there was only an isolated variation, in which women had better oral comprehension of complex sentences than men. The study data corroborate the claims of the literature on the existence of biological differences between men and women on hormonal issues and life expectancy, is not possible, however, correlate only the genre without taking into account socioeconomic and genetic factors in stroke<sup>20, 21</sup>.

In this study, it was not possible to say that with increasing age, there is an improvement or worsening in the performance of each comprehension test. Even being observed in the oral comprehension of simple sentences, a tendency to decrease in performance with increasing age, this fact does not mean that in healthy subjects does not happen the same phenomenon. It is suggested, with respect to the tasks evaluated in this study, that age was not shown to be a determining factor for the understanding, which is consistent with published studies<sup>20, 21</sup>.

The results highlight the need to undertake further studies, and future research, increase the sample requirements regarding age, education and gender to obtain the best parameters for assessment and rehabilitation in cases of dysarthria.

## ■ CONCLUSION

There are signs of a continuous relationship starting from the word to more complex phrase levels, both for spoken and written language. This

continuity reveals that the comprehension of simpler structures benefits the comprehension of more complex structures and that the difficulty in comprehension of simple structures shows a direct relation with the difficulty in comprehension of complex structures. This result reveals not unprecedented, but is important in that it adds data to the study of dysarthric speech.

On comparing the comprehension battery and gender, no gender effect was observed, only an isolated variation in which women showed a better comprehension of spoken complex phrases than men in this group.

The findings of this study did not show age as a determinant factor for comprehension as studied in this presentation.

## RESUMO

**Objetivo:** apresentar estudo sobre a compreensão de linguagem em sujeitos disártricos. **Método:** estudo retrospectivo, descritivo, de caráter qualitativo e quantitativo com 60 sujeitos com idade entre 40 a 70 anos. Foi realizado o cruzamento das tarefas de compreensão do protocolo Montreal Toulouse (versão alfa): compreensão de palavras orais (CPO) e escritas (CPE); frases simples orais (CFSO) e escritas (CFSE); frases complexas orais (CFCO) e escritas (CFCE). **Resultados:** com respeito à comparação entre a compreensão oral e a escrita, quanto maior a CPO maior a CPE; quanto maior a CFSO, maior CFSE e vice-versa; relativamente à compreensão oral e escrita, quanto maior a CP, maior CF; quanto maior a CFS, maior CFC e vice-versa; em relação à comparação de idade, gênero, e CFCO e CFCE, não se observa relações significativas. **Conclusão:** nos pacientes deste estudo, verificou-se que a compreensão das estruturas mais simples favorece a compreensão das mais complexas; a dificuldade de compreensão de estruturas simples apresenta relação direta com a dificuldade de compreensão de estruturas complexas.

**DESCRIPTORIOS:** Compreensão; Linguagem; Disartria; AVC

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