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Syntactic aspects of impaired speech in interface with prosody and information structure: data from Broca's and Wernicke's aphasia

Aspectos sintácticos de la alteración del habla: datos de la afasia de Broca y de Wernicke

Aspectos sintáticos da fala prejudicada: dados da afasia de Broca e de Wernicke

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Abstract: This paper aims at studying how the syntactic component of language develops in the speech of people with Broca's and Wernicke's aphasia in interface with prosody and informational structure. The data consists of two short interviews in English with aphasic patients. Broca's aphasia is characterized by the difficulty in processing and producing syntactic structures. In Wernicke's aphasia, the semantic component is affected, which ends up generating a disconnected and meaningless speech. It was found that in Broca's aphasia the patient marked some heads of English in final position – as head-final similar to languages like Japanese – instead of head-first, a common parameter of English. In Wernicke's aphasia, there were some inadequacies in the use of adjuncts and complements that resulted in semantic anomalies.

Keywords: Spoken syntax. Aphasia. Semantics. Prosody.

Resumen: Este artículo tiene como objetivo estudiar cómo se desarrolla el componente sintáctico del lenguaje en el habla de personas con afasia

de Broca y de Wernicke en interfaz con la prosodia y la estructura de información. Los datos consisten en dos entrevistas cortas en inglés con pacientes afásicos. La afasia de Broca se caracteriza por la dificultad en el procesamiento y la producción de la sintaxis. En la afasia de Wernicke, el componente semántico se ve afectado, lo que termina generando un discurso desconectado y sin sentido. Se descubrió que en la afasia de Broca el paciente marcaba algunos núcleos del inglés en la posición final – como núcleo-final similar a idiomas como el japonés – en lugar de núcleo-inicial, un parámetro común del inglés. En la afasia de Wernicke, hubo algunas deficiencias en el uso de adjuntos y complementos, que dieron lugar a anomalías semánticas.

Palabras clave: Sintaxis del habla. Afasia. Semántica. Prosodia.

Resumo: Este trabalho tem por objetivo estudar como se desenvolve o componente sintático da linguagem na fala de indivíduos com afasia de Broca e de Wernicke em interface com a prosódia e a estrutura informacional. Os dados consistem em duas entrevistas curtas em inglês com pacientes afásicos. A afasia de Broca se caracteriza pela dificuldade no processamento e na produção da sintaxe. Na afasia de Wernicke, o componente semântico é afetado, o que acaba gerando um discurso desconexo e sem sentido. Foi constatado que na afasia de Broca o paciente marcava alguns núcleos do inglês em posição final – como núcleo-final semelhantemente a línguas como o japonês – ao invés de núcleo-inicial, um parâmetro comum do inglês. Na afasia de Wernicke, houve algumas inadequações no uso de adjuntos e complementos, que resultaram em anomalia semântica.

Palavras-chave: Sintaxe da fala. Afasia. Semântica. Prosódia

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1 Introduction

This paper is part of a larger project to study spoken syntax (cf. SILVA, 2020a, 2020b; SILVA; MELLO, 2016a, 2016b, SILVA; PAULA, 2021). This project aims to analyze how syntax interacts with the informational structure of the utterance. In this type of analysis, the acoustic signal is considered, since the information structure is conveyed by prosody (BAUMANN, 2006; DePAPE et al. 2012; GUT & PILLAI, 2014; HIMMELMANN, 2018). The prosodic component ensures that syntax is analyzed as it was actually delivered in speech, and not as a transcription-based analysis. In this approach, the underlying model for the identification of prosodic units is the IPO model ('t HART et al. 1990). The respective pragmatic correlates that will compose the utterance's information structure are added to the unit described in this model (CRESTI, 2000). The interaction of syntactic aspects with prosody and information structure provided some findings, e.g., the distribution of verbal negation in Brazilian Portuguese complies with informational restrictions (cf. SILVA; MELLO, 2016a, 2016b). Pre-verbal negation in its canonical form has free distribution among the units that make up the utterance's information structure, whereas the non-canonical forms as double and post-verbal negation are only subject to occur in units with illocutionary value. It means that it is necessary to have the presence of the illocutionary force to enunciate them. In another study, it was found that NPs distributed in Topic units tend to be the verb's syntactic subject of the next unit if they are animate, definite and a given information in speech, whereas if they are inanimate and indefinite, they are more likely to be anacolutha (cf. SILVA, 2020b).

This study concerns speech's syntactic aspects of individuals with aphasia, taking into account the information structure revealed by prosody, as in previous studies. As aphasias affect syntactic and semantic aspects of speech, it is important to note how these linguistic levels are affected in linguistic production. It can serve as a window on the processes that underlie linguistic phenomena, in addition to the organization of linguistic production in the absence

of important elements, such as functional words. Regarding the semantic level, it is important to understand what makes the production meaningless, that is, which linguistic elements contribute to this and how those discourses are organized. For this, linguistic analysis is essential. This paper is organized as follows. In this first section, we discuss what aphasia consists of. In section 2, we briefly sketch the information structure model we took for the data analysis. In section 3, we show what Broca's aphasia is and analyze a text that exemplifies this type of aphasia. In section 4, it is shown what Wernicke's aphasia is and analyze a text that exemplifies this type of aphasia. In section 5, we make some comments summarizing previous analysis. Finally, the last section concludes the paper.

2 What is aphasia?

The term aphasia covers variants of the same disorder and it is largely related to lesions in the specific brain areas that affect the comprehension and/or elaboration of language (cf. DAMASIO, 1992; BROOKSHIRE, 2015). The essence of aphasia would be "(...) a disorder of linguistic processing, a disruption of the mechanisms for translating thought to language" (DAMASIO, 1992, p. 531). It can result in the impairment of almost any facet of the language, from the processing of written representation to difficulties related to phonology, including morphology, syntax, lexicon, etc.

Aphasias are classically defined as fluent and non-fluent, anterior and posterior or expressive and receptive. Fluent aphasias are those in which patient can speak relatively fully, without many hesitations or difficulties in expressing himself, although words may not convey the meaning that was intended by the speaker. Due to the fact that in this kind of aphasia there is greater difficulty in comprehension than in production, it is also called receptive. Finally, the term *posterior* refers to the tendency of this type of aphasia to be related to lesions in the temporal lobe of the brain

(cf. HALLOWELL, 2017; EDWARDS, 2005). Non-fluent aphasias, on the other hand, are those in which the patient has greater difficulty in language production, therefore, the term *expressive aphasia* is also used. It is also associated with the production of few words, usually with absence of functional items for discourse articulation. This type of aphasia is called anterior because it is related to lesions in the frontal lobe (cf. HALLOWELL, 2017; MENN et al. 1995).

Nevertheless, Hallowell (2017) mentions that despite the classifications and labels, patients with aphasia hardly fit into all the parameters that make up an aphasia subtype, especially because the symptoms can change over time. Although there are different types of aphasia, we are interested in the so-called classical ones, that is, Broca's and Wernicke's aphasia. The importance of considering the speech of patients affected by aphasia lies in the fact that the structural layers of language can be observed with greater transparency. When impaired, syntactic or semantic aspects, can be somewhat isolated for linguistic analysis, especially when compared to normal speech, thus revealing how language is constructed from fundamental components in impaired condition.

3 Information structure model

In order to analyze the speech data, we have chosen an information structure model based on the Language into Act Theory [L-AcT] (CRESTI, 2000). This theory deals with the pragmatic nature of the speech. The utterance is the reference unit of this diamesia, and it is defined as the minimal stretch of speech with pragmatic autonomy and interpretability in isolation. Each utterance conveys a speech act (cf. AUSTIN, 1962) through the illocutionary force of the Comment unit – the only necessary and sufficient unit to an utterance to be performed. Speech unfolds through prosody. This component is responsible to segment the speech into tonal units. Each tonal unit in the prosodic level corresponds to an information unit in the pragmatic level. A tonal unit can be composed by a

prosodic break of two types: (i) a terminal break and (ii) a non-terminal break. A terminal break ends the utterance and a non-terminal break corresponds to an internal unit of the information structure of the utterance. So a tonal unit with a terminal break conveys the Comment unit and a tonal unit with a non-terminal break can convey different kinds of information units. Tonal units conveyed by prosody are bounded with information units, and each information unit has its prosodic profile concerning f0 movements, intensity, and duration. Each information unit exhibits a specific function in the speech chain, as can be seen in the table 1[1].

Table 1 – Tagset of the main Information Units within L-AcT

Name	Tag	Definition
Comment	COM	Accomplishes the illocutionary force of the utterance. It is necessary and sufficient for the performance of the utterance.
Topic	TOP	Identifies the domain of application for the illocutionary act expressed by the comment, allowing a cognitive reference to the speech act. It allows the utterance to be displaced from the context (linguistic and non-linguistic).
Appendix of Comment	APC	Integrates the text of the Comment and concludes the utterance, marking an agreement with the addressee.
Locutive Introducer	INT	Expresses the evidence status of the subsequent locative space (simple or patterned) marking a shift in the coordinates for its interpretation.
Multiple Comment	CMM	Constitutes a chain of Comments which form an *illocutionary pattern* i.e. an action model which allows the linking of at least two illocutionary acts, for the performance of one conventional rhetoric effect.

1 We show only the units that appeared in the data that we analyzed.

Bound Comment	COB	A sequence of Comments, which are produced by progressive adjunctions which follow the flow of thought. It forms a *Stanza* out of any informational model.
Dialogic Auxiliary	AUX	Unit that do not contribute to the semantic content of the utterance and have functions that regulate the communication; it is directed towards the interlocutor.

Source: Adapted from Moneglia and Raso (2014, p. 490)

Speech comprises some disfluencies, which are considered in L-AcT as units with no information value, as can be seen in table 2.

Table 2 – Tagset of the main units with no information value within L-AcT

Name	Tag	Definition
Scanning unit	SCA	Used when a Prosodic unit does not bear an information nucleus and does not signal any information function, but rather scan the locutive content.
Empty unit	EMP	Used when one prosodic unit is filled with material whose informational content is not to be considered in the overall content of the utterance as happens when: (a) retracting; (b) the last unit of an utterance is interrupted. For ex. in *John says [/2]*^{EMP} *John said that he likes pasta //*^{COM}
Time Taking	TMT	Tag used for the so called filled pauses.

Source: Adapted from Moneglia and Raso (2014, p. 491)

The interaction of prosody, information structure and syntax in the impaired speech of Broca's and Wernicke's aphasia is going

to be analyzed in the next sections, considering the information pattern model of L-AcT presented in this section.

4 Broca's aphasia

In Broca's aphasia, production and processing of syntax is impaired. This aphasia type is characterized by "(...) non-fluent conversation, decreased verbal output, increased effort in speaking, shortened sentence length, dysprosody, and agrammatism (reduction of syntactic filler words in retention of nouns, verbs, and adjectives)" (WEBB, 2017, p. 210). Comprehension of grammatically more complex structures is also impaired. For instance, patients with Broca's aphasia tend to have difficulty understanding reversible passive, such as *John was kissed by Mary*, in which it would be plausible that both John and Mary are capable to perform the act of kissing, unlike the non-reversible passive such as *The ball was kicked by John*, in which only John has the ability to perform the act of kicking, although this difficulty is not a rule for all patients (BERN et al. 1996). Knowledge of the grammatical rules of language seems, in some cases, not to be affected by aphasia, given that some patients are able to judge the grammaticality of certain structures at a level above chance (LU et al. 2000). In this case, the problem seems to be further related to the implementation of the rules.

Agrammatism is characterized by the absence of functional words (prepositions, conjunctions, pronouns, auxiliary verbs) in speech. As the agrammatic speech develops mostly through content words (names, verbs, adjectives, adverbs) and it is permeated by short sentences and simple phrases, the patient's speech is called telegraphic. Absence of inflection or inappropriate inflection in verbs is also a characteristic feature in Broca's aphasia (FAROQI-SHAH & THOMPSON, 2007). In addition, there may be dysnomia – inability to name objects even when they are perceived or difficulty finding words (COELHO et al. 2000) and circumlocutions – use of

descriptions to define a simple word, for instance, the description *the place where things are sold* instead of the word *mall* (STEIN, 2004). As a consequence of all problems related to this type of aphasia, disfluencies in the patient's speech are three times more frequent than in normal speech (YAIRI et al. 1981). The quality of life of patients, including socialization activities, tends to be worse than that of normal individuals, which causes psychological and emotional damages (PALLAVI et al. 2018).

Below is a speech excerpt of an individual with Broca's aphasia. The data was extracted from the site of the Tractus Therapy Institution[2]. This is an institution that develops speech therapy apps for adults recovering from a stroke. In their website there are some information explaining what aphasia is and videos illustrating speech in patients suffering from Broca's and Wernicke's aphasia. The data consists of a short interview that was transcribed, segmented, and annotated by us (see SILVA, 2020a for further explanation of the annotation criteria for oral data). We will briefly indicate the adopted conventions for data annotation carried for this study. Single slash indicates non-terminal prosodic break, whereas double slashes indicates terminal prosodic break. As shown before, information units are annotated as COM (Comment), APC (Appendix of Comment), AUX (Dialogic Auxiliary, also known as discourse makers in the literature), COB (Bound Comment), CMM (Multiple Comment), TOP (Topic), INT (Locutive Introducer). Disfluencies units are annotated as SCA (Scansion), EMP (Empty unit – it means a linguistic content was cancelled due to a retracting, marked as '[/n]', where 'n' stands for the number of words retracted, or due to a interrupted utterance, marked as '+'), TMT (Time-taking, such as 'ah' and 'eh', all of them is evenly marked as '&he'). The symbol 'hhh' indicates laughter. Three capital letters after an asterisk indicate the speaker's acronym and the number between the brackets indicates the number of each utterance. For our purposes, it is crucial to know that information units develop in interaction with prosody and that COM, CMM and COB are units

2 The website's address is the following: <https://tactustherapy.com/>.

that convey the illocutionary force, accomplishing an illocution or a speech act.

It is possible to notice that several features that characterize Broca's aphasia reported above are present in the patient's speech.

Example 1 – Speech of an individual with Broca's aphasia

*MEG: [1] can you tell us your name //COM

*MIK: [2] I /SCA Mike Caputo //COM

*MEG: [3] and Mike /INT when was your stroke //COM

*MIK: [4] I was [/2]EMP &he /TMT seven /SCA years /SCA ago //COM

*MEG: [5] okay //COM

*MIK: [6] and +EMP

*MEG: [7] and /AUX what did you used to do //COM

*MIK: [8] &he /TMT well /AUX &he /TMT worked //COM [9] &he /TMT Autodesk //COM [10] &he /TMT seven [/1]EMP seven /SCA

*WIF: [11] sales //COM

*MIK: [12] / sales //COM [13] sales /COB and /AUX worldwide //COM [14] and /AUX very good //COM [15] yeah //COM

*MEG: [16] okay //COM [17] and who are you looking at over there //COM [18] when you <turn your head> //COM

*MIK: [19] <that's my> /SCA wife //COM

*MEG: [20] okay //COM [21] and why is she helping you /COM to talk //APC

*MIK: [22] &he /TMT she is [/2]EMP &he /TMT speech //COM [23] &he /TMT

*MEG: [24] so you have trouble with your speech //COM

*MIK: [25] / yeah //COM [26] yeah //COM

*MEG: [27] and what's that called //COM

*MIK: [28] &he /TMT phasia //COM

*MEG: [29] alright //COM [30] and /AUX so why don't you work now //COM

*MIK: [31] &he /TMT I [/1]EMP I [/1]EMP well /AUX I /SCA do //COM

*MEG: [32] and what do you do now //COM

*MIK: [33] &he /TMT Voices of Hope /COB Aphasia //COM

*MEG: [34] and what is Voices of Hope //COM

*MIK: [35] &he /TMT Peterburgh / &he /TMT Peterburgh //COM [36] and /AUX &he /TMT doctor /SCA Hinckley /TOP and /AUX &he /TMT and /AUX &he /TMT my / self / &he /TMT founder //COM [37] founder /SCA for me //COM [38] and /AUX &he /TMT I [/1]EMP I [/1]EMP &he /TMT members [/1]EMP &he /TMT members [/1]EMP &he /TMT the [/1]EMP the /SCA &he /TMT members /SCA probably /SCA seven /SCA six /SCA zero /SCA people //COM

*MEG: [39] so /AUX sixty people /TOP are part of Voices of Hope //COM

*MIK: [40] yes //COM

*MEG: [41] which is an aphasia support group //COM

*MIK: [42] yes //COM

*MEG: [43] that you founded //COM

*MIK: [44] yes //COM

*MEG: [45] and doctor Jackie Hinckley is part of that //COM

*MIK: [46] yes //COM

*MEG: [47] okay //COM [48] great //COM

*WIF: [49] it's not a support group //COM

*MIK: [50] no //COM

*WIF: [51] <it's a /SCA program> //COM

*MIK: [52] <it's /SCA programs> //COM [53] it's [/1]EMP it's /SCA &he /TMT three / month [/2]EMP three /SCA days /COB &he /TMT &he /TMT Monday /COB Wednesday /COB Friday //COM [54] and /AUX the [/1]EMP the [/1]EMP &he /TMT and they /SCA laugh /COB and [/1]EMP and /AUX talked /COB &he /TMT music /SCA hear

//COM [55] this [/1]EMP this beautiful /COB it's [/1]EMP you know //COM

*MEG: [56] great //COM

*MIK: [57] yeah //COM

*MEG: [58] can you tell me /TOP &he /TMT what does it feel like /SCA to have aphasia //COM

*MIK: [59] &he /EMP it's [/1]EMP it's /SCA hard //COM [60] it's /SCA &he /TMT well /AUX it's [/1]EMP speech /TOP it's /SCA like / &he /TMT words that don't /SCA understand //COM [61] brain is good //COM [62] you know //COM [63] &he /TMT but it's /SCA &he /TMT speech /SCA like /SCA &he /TMT I don't know /COB it's like / SCA &he /TMT words /SCA yuk hhh //COM

*MEG: [64] okay //COM

*MIK: [65] yeah //COM

*MEG: [66] alright /AUX thank you so much //COM [67] bye bye //COM

*MIK: [68] bye bye //COM

Firstly, it is noteworthy that disfluency strongly affects MIK speech, because of a high amount of scansion, time taking, and retracting. This increases considerably each turn's length when there is a greater elaboration of the linguistic content, even though production does not reflect a complex syntactic articulation. It is also quite noticeable the telegraphic speech style, composed mostly by nouns, adjectives and verbs, as well as frozen expressions such as *you know*, *it's like* and discourse regulating items such as *and* and *well*. When the linguistic content is more complex, the speaker tends to produce words as adjusted possible to an intonation indicating discursive continuity. The low syntactic articulation caused by the absence of functional morphemes is compensated by the prosodic information that, in addition to guaranteeing the maintenance of

the turn, tends to replace the function evoked by such morphemes, in order to generate the semantic compositionality effect impaired by the problems caused by aphasia.

Some remarkable features of MIK's speech are (i) absence of copula in utterance 2, (ii) absence of the subject pronoun in the utterance 8, (iii) absence of preposition in the utterance 9 (MIK worked in the sales area of the software development company called Autodesk), (iv) the priming of the word *seven* mentioned in the utterance 4 in order to produce the word *sales* in the utterance 10, (v) the absence of subject and copula in the utterance 14, (vi) nouns in place of more complex contents from a lexical and syntactic point of view, such as *speech* in the utterance 22 (MIK probably wanted to say that his wife was helping him with questions related to speech, given that he has problems in this area), this phenomenon is repeated in the utterances 33 and 35, (vii) absence of copula in the utterance 36 and determiner and plural morpheme in *founder*, (viii) absence of verb in the utterance 38, (ix) decomposition of the numerals seventy and sixty by their written representational counterparts, that is, 60 (six and zero) and 70 (seven and zero), (x) inappropriate past inflection in *talked* in the utterance 54, (xi) absence of syntactic articulation and inappropriate verb in *music hear* (probably MIK meant *they listen to music*) in the utterance 54, (xii) absence of copula in the utterance 55.

In addition, there seems to be an exchange of the active semantic center from which the arguments are distributed around the verb, which generated a "passive" syntactic restructuring of the nucleus marking characteristic of a VO language such as English for the structuring of an OV language such as Japanese, as in *founder for me* instead of *I'm one of the founders* (adposition + noun to noun + adposition), *music hear* instead of *they listen to music* (verb + object to object + verb), *words that don't understand* instead of *I don't understand some words* (verb + object to object + verb, in this case the complementizer is required to undo the active interpretation that the sentence would have if it were not present).

So the structures are exhibiting a head-final pattern instead of head-first pattern as it is English.

5 Wernicke's aphasia

In Wernicke's aphasia, the ability to understand the meaning of words and sentences is affected, although articulated speech production remains relatively unchanged. Patients manage to make grammatically correct sentences with common prosody, nevertheless these sentences do not make much sense from a semantic point of view. The main characteristic of this type of aphasia includes creation of neologisms, paraphasias, logorrhea, press of speech, continuous perseverance and serious difficulties with reading and writing (HALLOWELL, 2017). Paraphasias refer to the substitution of words or parts of words. This phenomenon occurs at the semantic or phonemic level (BUTTERWORTH, 1979; LEWIS & SOARES, 2000). For example, the substitution of *ear* for *nose* (words from the same semantic field) or *cars* for *stairs* (words of different semantic fields), as well as the substitution of phonemes in *tegetal* for *vegetal*. Logorrhea refers to an excessively fluent production or, to put it another way, a compulsion to speak that results in meaningless speech with a profusion of disconnected sentences (ARSENI & D**ĂNĂILĂ**, 1977). Press of speech indicates that the speaker continues to produce his speech even if the content does not make any sense to his interlocutor, breaking social conventions related to linguistic interaction (GOODGLASS & KAPLAN, 1983). Continuous perseverance indicates a repetitive linguistic behavior based on a previous stimulus. For instance, after saying *piano*, in response to a presented image of a piano, the speaker continues to say the word *piano* for images of *violin*, *cello*, *flute* etc. This phenomenon occurs at lexical, semantic, and phonemic levels (JAKOBSON, 1956; DAMASIO, 1992; BASTIAANSE et al. 1996).

The following excerpt presents the speech of a patient with Wernicke's aphasia caused by a stroke[3]. It is possible to observe several phenomena mentioned above in BYR's speech. A fact to be highlighted is the apparent incongruity between the prosodic outline and the semantic content of his speech, that is, the intonation he produces is somehow pragmatically inappropriate for some parts of the content he utters, something typical of patients with Wernicke's aphasia.

Example 2 – Speech of an individual with Wernicke's aphasia

*MEG: [1] hi Byron //COM [2] how are you //COM

*BYR: [3] I'm happy /COB are you pretty //COM [4] you look good //COM

*MEG: [5] what are you doing today //COM

*BYR: [6] we stayed with the water over here at the moment /COB and talk with the people /COM for them over there //APC [7] they're diving for them /COM at the moment //APC [8] but they'll save in the moment /COB held water /TOP very soon //COM [9] for him //COM [10] with luck //COM [11] for him //COM

*MEG: [12] so we're on a cruise /COB and we're about <to get to Juneau> +EMP

*BYR: [13] <we will sort right> here /TOP and they'll save their hands right there //COM [14] <for them> //COM

*MEG: [15] <and> +EMP [16] what were we just doing with the iPad //COM

*BYR: [17] &he /TMT right at the moment /TOP they don't show a darn thing hhh //COM

*MEG: [18] with the iPad /COM that were we doing //APC [19] we [/1] EMP like /SCA here //COM

3 This excerpt was extracted also from the Tractus Therapy website.

*BYR: [20] I'd like my change for me /COB and change hands for me //COM [21] it would happy //COM [22] I would talk with Donna sometimes //COM [23] we're out with them //COM [24] other people are working with them and them //COM [25] I'm very happy with them //COM

*MEG: [26] good //COM

*BYR: [27] this girl with verly good //COM [28] and happy //COM [29] and I play golf //COM [30] and hit up trees /COB we play out with the hands /COB we save a lot of hands on hold for peoples /COM for us // APC [31] other hands //COM [32] I don't know what you get /CMM but I talk with a lot of hand for him //CMM [33] sometime //COM [34] am I talk of anymore to saying //COM

*MEG: [35] alright //COM [36] thank you very much //COM

*BYR: [37] thank you very much /COB I appreciate it /COB and I hope the world lasts for you //COM

*MEG: [38] thank you / it's been a pleasure //COM [39] bye-bye // COM

*BYR: [40] have a good day //COM

The first fact noticed when comparing the speech of BYR with that of MIK is the extremely reduced number of disfluencies. The disfluencies that occur in BYR's speech are at the level of what is expected from normal speech, that is, unlike MIK, he does not seem to have any difficulty in linguistic production. However, BYR's discourse is quite disconnected, because the semantic component is severely affected. That is the main reason why his speech does not make sense. Even if we have a sophisticated capacity for inference, it is difficult to understand BYR's speech since his lexical choices reflect very little of the pragmatic-discursive context. An example of this occurrence is the answer given to the question of MEG in the utterance 18. What would be the content relation of the chain formed by the utterances 20 to 25 to the question asked in the utterance 18? It is possible to notice that his discourse is permeated by logorrhea and press of speech, as it occurs in the utterances

27 to 35. In prosodic terms, except that the intonation in some cases may present a certain incongruity with lexically transmitted content, there seems to be no anomaly, that is, prosody develops normally from an articulatory point of view.

Unlike MIK's speech, BYR's speech develops mostly through sentences that include the functional elements providing syntactic articulation. The majority of the structures are syntactically well formed, that is, the establishment of phrases and argument structure are relatively preserved, contrary to what occurs in MIK's speech, in which the argument structure is partially affected, and may present, for instance, verbs without a subject. In BYR's speech, there are (i) semantic inadequacy of adjuncts, as in the utterance 7 (*for them) and in the utterance 25 (with them), (ii) semantic inadequacy of complements, as in the utterance 30 (a lot of hands), and of coordination, as in the utterance 24 (and them).*

In addition, there are several pragmatic inadequacies in the text, manifested mainly in the lexical scope and in the sequence in which the constituents and the clauses are distributed. It causes a discursive disarticulation and generates anomalies in the meaning, causing strangeness in the interlocutor. E.g., I would talk with Donna sometimes and we're out with them are adjacent clauses, but this distribution does not provide a semantic nexus precisely because there is no relation of the lexical content between one clause and another or to other previously mentioned content in the text. There is a rupture in meaning caused by the content of the second clause. To unmake this anomaly, the next clause should be lexically-semantically related to the previous one, as in I would talk with Donna sometimes, She is very nice/I like her/Past five days I couldn't etc. Despite the semantic load that an argument or an adjunct inappropriately made produce, the structures that hold them are not ungrammatical. There is apparently only one case of ungrammaticality. The structure of the utterance 27 is malformed because it seems to lack a nominal nucleus in the phrase with verly good, as in this girl with verly good tastes (will show us nice places to visit abroad). It is noteworthy that the word verly could be a

neologism instead of a possible variant of the adverb very, since in the utterance 37 BYR uses the conventional form of this adverb.

6 Comments on the syntactic component in aphasias

Considering the standard English, sequences like I Mike Caputo, worked Autodesk, sales and worldwide and very good, this beautiful (predicative function), music hear and this girl with verly good would be at least partially ungrammatical, because some items that connect elements are missing. From a semantic point of view, but I talk with a lot of hand for him, we save a lot of hands on hold for peoples and am I talk of anymore to saying would be anomalous sequences. Depending on the level of grammaticality, it is possible to process the text and understand it. It occurs in the case of MIK's discourse, in which even in the absence of elements that connect phrases or sentences, we are able to cognitively process and understand what is being said. From a syntactic point of view, it can be said that the same occurs in the case of BYR's discourse. It means that syntactic structures are processed even if they do not semantically make sense. In other words, the semantic anomaly in this case does not prevent the understanding of the syntactic structure. Evidently, the global comprehension of the text is affected since the semantic content would not correspond fully to the reality of the situation or the outside world.

Our capacity for inference enables us to understand MIK's speech relatively effectively and BYR's speech much less effectively. For example, knowing that BYR was on a cruise, it becomes further understandable to infer the meaning of the clause we stayed with the water over here at the moment, probably something like 'the people on the ship, including BYR, had only the sea as their horizon of view until that moment'. It is more difficult to understand the meaning of the clause, but I talk with a lot of hand for him, since there is no pragmatic clue that allows us to minimally reach its meaning via inference. In MIK's discourse, the absence of the

subject pronoun and preposition in worked Autodesk, for instance, does not prevent the inference process regarding 'who work in what place'. A first point to be raised, therefore, is the effective comprehension of the syntactic structures that occur in the texts of the two previous sections. Even in the case of agrammatism, that is, in the absence of functional items in speech, we are able to process textual sequences in many cases as constituents or clauses that are, therefore, part of a structure, even though they are affected by the effects of aphasia.

A second point to be noted is the low informational variability that exists mainly in MIK's discourse. Since it is difficult to produce a syntactically articulated discourse, the linguistic content that MIK produces is most developed through illocutionary sequences with or without disfluencies during the production of the utterances. It limits the informational potential of his speech, restricted, especially, to COM or COB units. The difficulty of fluently initiate and maintain his discourse using a precarious syntax radically reduces the accomplishment of the information structure of the utterances. Information variability, therefore, depends to large extent on the structural complexity or the syntactic organization capacity of the lexicon. It implies that the greater the possibility of syntactic complexity, the greater the chance of an information variability resulting from the pragmatic organization of the structures. Conversely, the lower the syntactic complexity, the less likely it is that structures will be distributed across a complex information packaging. Although there is greater syntactic complexity in BYR speech, information variability is also reduced, but evidently on a smaller scale than in MIK's speech. Probably, it is due to other factors, such as the articulation or the speech rate of the utterances. That is, the faster the accomplishment of a complex structure occurs, the less chance there will be of variation in the information structure.

In general, the speech of the North Americans seems to be oriented toward a higher rate of articulation. In a study of English language carried with data from narratives, the rate of clauses

corresponding to a single prosodic unit or an Intonation Phrase (IP) was 70-75% (CHAFE, 1987), which illustrates a similar pattern found in BYR's speech also in normal North American speech. Emotional factors also have an impact on prosody and could also contribute to reducing the variability of the information units of the utterances. As life quality of this population tends to be lower when compared to people without aphasia (ROSS & WERTZ, 2003), these factors could easily emerge, thus impacting the performance of oral discourse.

A third point to be mentioned is the adequacy of the constituents and clauses in proper information units of the two discourses. The distribution of BYR's speech clauses always respects prosodic-information unit even though they are semantically disconnected. In other words, the semantic anomaly does not trigger a disorderly distribution of syntactic structures between different information units. Constituents and clauses are preserved of a possible interference in the prosodic-information segmentation. The occurrences of PPs in 9-11 as autonomous utterances reveal that this kind of phrase is sufficient to harbor the illocutionary force conveyed by prosody. The role of constituents is, therefore, particularly important in speech since they not only organize the syntactic structure but also act as a vehicle for the transmission of illocutions when they have prosodic-pragmatic autonomy. In the case of MIK's speech, despite the lack of functional words, structures are processed as constituents since we understand the meaning of the expressions in this way. For example, if we did not process worked Autodesk as I've worked at Autodesk, that is, Autodesk as a PP without preposition, the meaning construction would take place in a different way and carry a semantic interpretation different from the one intended by the speaker and understood by us, that is, that MIK worked at Autodesk company. It implies that the constituent's psychological reality is not affected by the absence of functional words.

7 Final remarks

This study exhibited some aspects of the syntax with data from two individuals with aphasia. The interface between syntax and prosody was considered to explore the development of the syntactic component in utterances carried out in speech. In the case of Broca's aphasia, it was found that despite the absence of functional elements, we were able to process and understand the structures. In the case of Wernicke's aphasia, the comprehension of structures is impaired by the fact that the semantic component is severely affected, which ends up contributing to the production of anomalous adjuncts and complements in the syntactic structures of the utterances. A phenomenon to be noticed in the speech of the individual with agrammatism is that he uses the prosodic signal to compensate for the low syntactic articulation caused by the absence of functional items. This is an important point that shows how different domains of language interact in the process of speech production. It also exemplifies the distinction between such domains, as well as their dissociation, even though they act together to carry out and maintain the discourse. This fact further shows that the problem of agrammaticality lies more in the syntactic than in the prosodic component, although there is a clear difficulty in production that results in a high number of disfluencies. An example of this fact is that agrammaticality exhibited difficulties in processing both linguistic and musical syntax, which in this case involves the perception of pitch, tone, chord, and harmony (cf. PATEL et al. 2008). The phenomena analyzed in this paper illustrate how we can understand speech, more specifically syntax, of individuals with aphasia.

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