

Silvia Martínez-Ferreiro
Centre for language and Cognition (CLCG)
University of Groningen

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Sabina Halupka-Rešetar
Faculty of Philosophy
University of Novi Sad

VERBAL DEFICITS IN APHASIA: EVIDENCE FROM NATIVE SPEAKERS OF SERBIAN¹

Deficits in word retrieval are commonly attested in aphasia. These have a major impact in verbs, especially after lesions causing the emergence of Broca's aphasia. Verbs are not only complex entities, but the core of the sentence, and constitute a central issue for both the proper understanding of language deficits, and assessment and recovery purposes. In this paper, we review the existing literature describing the speech of Serbian-speaking individuals with aphasia to explore the degree of preservation of verbal forms in this population. The role of different factors – such as the nature of the verb, its argument structure and the morphological markers attached to it – are discussed and contrasted in these lines against the multiple hypotheses proposed so far in the search for a unified explanation.

Key words: action words, argument structure, inflectional morphology, Serbian

Deficits in the production and comprehension of verbs have been widely reported in the field of aphasiology (Miceli, Silveri, Villa and Caramazza, 1984; Saffran, Berndt and Schwartz, 1989; Zingeser and Berndt, 1990; Thompson, Shapiro, Li and Schendel, 1994; Bastiaanse and Jonkers, 1998; Bastiaanse and Edwards, 2004; Lee and Thompson, 2004; among many others). In this paper, we focus on the existing data from Serbian-speaking individuals with aphasia, and pursue a generalized explanation of verb deficits in current linguistic terms. To do so, we have structured this paper as follows: in the section 1, we provide a definition of aphasia together with a summary of the main cross-linguistic findings in the field. Section 2 reviews the different hypotheses proposed to explain

¹ s.martinez.ferreiro@rug.nl

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these findings. In sections 3 and 4, we focus on Serbian, its grammatical description, and the results of the studies carried out so far. The paper concludes with a discussion of the results of Serbian-speaking individuals with aphasia in the light of the theoretical proposals introduced in section 2, as well as some hints on further research.

1. APHASIA AND CROSS-LINGUISTIC DEFICITS IN VERB RETRIEVAL

The term aphasia refers to a group of language pathologies of varied etiology that occur after brain insult to the eloquent areas of the brain and is observable in the form of production and/or comprehension problems. According to the set of preserved skills, certain syndromes can be grouped together as fluent aphasias, with major problems associated to comprehension and word retrieval, or as non-fluent aphasias, with major problems associated to production and the use of functional words. Wernicke's aphasia is the most representative type of the fluent aphasias, which also include conduction and anomic aphasia. Of these types, Wernicke's aphasia is certainly the most studied one. In the group of non-fluent aphasias, Broca's and global aphasia are the most representative members, together with transcortical motor aphasia. The relative degree of preservation of production, comprehension, repetition and naming skills are the key to establishing the specific diagnose (Goodglass and Kaplan, 1972, 1983, 2001).

Structured studies of action verbs at the single word and at the sentence level in Broca's aphasia have consistently shown the presence of verb retrieval problems (Bastiaanse and Edwards, 2004; Lee and Thompson, 2004). The results parallel previous observations made on the basis of spontaneous speech samples, which indicated a relatively less frequent use of lexical verbs (Saffran et al., 1989; Thompson, Shapiro, Li and Schendel, 1994), and/or low diversity of lexical verbs (Bastiaanse and Jonkers, 1998; see also Caramazza and Hillis, 1991). Even if verb deficits are not restricted to Broca's aphasia, the results of individuals with this aphasia type contrast with the results of individuals with anomia, who, despite their problems in retrieving words, do not show a dissociation between nouns and verbs (Miceli, Silveri, Villa and Caramazza, 1984; Zingeser and Berndt, 1990). Thus, a fluent – non-fluent distinction seems to arise with respect to verb errors, an issue to which we return in the discussion.

The errors documented in the production and comprehension of verbal forms have been claimed to be connected to the nature of the verb, specifically its frequency, conjugation and regularity (de Diego Balaguer, Costa, Sebastián-Galles, Juncadella and Caramazza, 2004; Cuetos, Domínguez, Baauw and Berthier-Torres, 2007), to its argument structure (Thompson, Shapiro, Li and Schendel, 1994; Thompson, 2003; Bastiaanse and van Zonneveld, 2004), or to the inflectional markers it hosts, such as tense and agreement markers (Friedmann and Grodzinsky, 1997; Wenzlaff and Clahsen, 2004; Burchert, Swoboda-Moll and De Bleser, 2005; Faroqi-Shah and Thompson, 2007).

Regarding inflectional morphology, evidence from non-fluent deficits indicates that though subject-verb agreement is not always completely spared, tense errors tend to be significantly higher than any other type of errors. This has been attested, among many other languages, for English, Dutch, German, French, Italian, Spanish, Greek, Hebrew, and Palestinian Arabic (Menn and Obler 1990; Friedmann and Grodzinsky, 1997; Friedmann, 2001; Stavrakaki and Kouvava, 2003; Wenzlaff and Clahsen, 2004; Faroqi-Shah and Thompson, 2007; Gavarró and Martínez-Ferreiro, 2007; Faroqi-Shah and Dickey, 2009). More recent studies have determined that this deficit cannot be generalized across tenses, as there is a clear asymmetry between past and non-past referring forms, with the latter being systematically better preserved (see for example, Stavrakaki and Kouvava, 2003; Nanousi, Masterson, Druks and Atkinson, 2006; Bastiaanse, 2008; Lee, Milman and Thompson, 2008; Bastiaanse, Bamyacı, Hsu, Lee, Yarbay-Duman and Thompson, 2011; Martínez-Ferreiro and Bastiaanse, 2013; for a cross-linguistic discussion see Bastiaanse, 2013).

Another dissociation emerges across verbal forms if argument structure is taken into consideration. Unaccusative verbs (e.g. *The leaves fell* [1 argument, + movement]) have been found to be severely affected in comparison to transitive verbs (e.g. *The girl sings a song* [2 arguments, – movement]), and unergative verbs (e.g. *The nun preys* [1 argument, – movement]) in individuals with non-fluent aphasia (Grodzinsky, 1995; Kim and Thompson, 2000; Thompson, 2003; Lee and Thompson, 2004; Bastiaanse and van Zonneveld, 2005; Sánchez-Alonso, Martínez-Ferreiro and Bastiaanse, 2011).

These observations call for an explanation within linguistic theory in order to characterize the performance of individuals with aphasia in terms of deviations from the general structure, rules and principles of language (Avrutin, 2001)

2. THEORETICAL APPROACHES TO VERB-RELATED DEFICITS

Different loci of impairment have been targeted to account for the verb-related deficits mentioned in Section 1. Two main sets of theories have been formulated in the literature, those focusing on deficits in the syntactic representation and those focusing on processing demands. Morphosyntactic deficits, and in particular the uniform crosslinguistic dissociation between tense and agreement (with the former being consistently better preserved) have attracted most attention. According to the Tree Pruning Hypothesis (TPH, Friedmann and Grodzinsky, 1997; Friedmann, 2001), the syntactic representation of individuals with Broca's aphasia is pruned at the Tense node and consequently, no node is projected from the pruning site upwards. These individuals may fail to inflect verbs for tense. The underlying idea of this structural proposal is that morphosyntactic impairment is the consequence of a loss of linguistic knowledge.

Contrary to this view, underspecification of certain features such as Tense (Tense Underspecification Hypothesis, TUH, Wenzlaff and Clahsen, 2004) and/or

Agreement features (Tense and Agreement Underspecification Hypothesis, TAUH, Burchert, Swoboda-Moll and De Bleser, 2005) have been considered to operate in the event of errors in verbal morphology, thus justifying the observed pattern of substitutions. Errors derive from a failure in the codification of specific features, crucially for this paper T(ense) and/or Agr(eement), subsequent to limitations in processing resources. Coding problems are also behind Faroqi-Shah and Thompson's (2007) and Faroqi-Shah and Dickey's (2009) Diacritic Encoding and Retrieval (DER) hypothesis, which predict problems with T and Asp(ect).

More general processing hypotheses have also been put forward. Piñango (2000) proposed the Slow Syntax Hypothesis (SSH), which points to the reduction of processing resources as the root of the syntactico-semantic deficits observable in aphasia. As a consequence of this reduction, and mostly based on evidence from cases of Broca's aphasia, discourse-linking has been claimed to be problematic (Avrutin, 2000, 2006). Regarding verbal forms, the PAsT DIscourse LInking Hypothesis (PADILIH, Bastiaanse, Bamyacı, Hsu, Lee, Yarbay-Duman and Thompson, 2011) attributes the observed dissociation between past and present forms in non-fluent aphasias to the fact that reference to the past is discourse-linked, and consequently expected to be impaired, while reference to the present is not.

In addition to inflectional morphology, differences in the argument structure of verbs have also received attention. Verbs with a complex argument structure have been found to be more difficult to produce than verbs with a simpler argument structure. This has been formalized in the Argument Structure Complexity Hypothesis (ASCH; Thompson, 2003). Not only has the number of arguments been found to have an effect but complexity has also been found to increase in the event of movement operations, something predicted by the Derived Order Problem Hypothesis (DOP-H; Bastiaanse, Koekkoek and van Zonneveld, 2003), which is based on the assumption that certain syntactic operations can be problematic for individuals with non-fluent aphasias. Deficits associated to movement are also behind the Trace Deletion Hypothesis (TDH; Grodzinsky, 2000), a structural account that roots on the idea that traces are deleted from the syntactic representations of individuals with Broca's aphasia. Due to space limitations, the reader is referred to Thompson and Bastiaanse (2012) for a more exhaustive review of the existing theories of grammatical deficits in non-fluent aphasias.

3. VERBS IN SERBIAN

This section offers a grammatical description of the verbal system in Serbian, with special attention paid to the specific verb-related deficits which are likely to occur in the production of Serbian individuals with aphasia and which include subject-verb agreement, tenses, and argument structure of verbs. Serbian is a language rich in verbal morphology with Tense, Agreement, and Aspect expressed by affixes, as well as flexible word order with second-position clitics. The grammatical system encodes three genders, two numbers, and three persons. Agreement

is of two types: subject-finite verb and subject-past participle agreement. Given that the system of verb conjugation in this language includes unique inflections for each combined person and number marking, subjects can be dropped in finite clauses.

The Serbian verbal system distinguishes finite and nonfinite verbal forms. Finite forms agree with their subjects in person and number (1). Complex tenses containing the past participle also agree in gender (person and number agreement on the auxiliary, gender and number agreement on the participle) (2).

- (1) a. Marija peva.
 Mary sing.Pres.3sg
 'Mary is singing.'
 b. Deca pevaju.
 children sing.Pres.3pl
 'The children are singing.'
- (2) a. Marija je pevala.
 Mary Aux.3sg sing.Part.Fem.sg
 'Mary sang.'
 b. Deca su pevala.
 children Aux.3pl sing.Part.Neut.pl
 'The children sang.'

The inventory of tense forms in Serbian includes three simple tenses (present, aorist, imperfect) and four complex ones (perfect, future, pluperfect, future 2; Progovac, 2005), although not all of these tenses are used equally frequently in colloquial speech. There is no distinct Tense marker for the present tense, the endings carry both the T(ense) and Agr(eement) features, which for Progovac (2005) might suggest that present tense is the default Tense or no Tense, i.e. that there are no Tense features on present tense. Aorist and imperfect do have their own tense suffixes, distinct from the agreement morphology.

Progovac (2005: 17) assumes that the lexical verb in Serbian raises to the highest functional projection in the clause, crossing all the intermediate functional projections (AgrS(subject) or T). Given that the participle is specified for agreement, it too will raise to AgrS to check its agreement features, unlike the infinitive form (used in the future tense constructions, or as a complement to a modal verb), which cannot raise to the AgrS projection, since it has no agreement or tense features to check (Progovac, 2005: 63-64). Bošković (2001, 2009) claims that it is not only finite verb forms that move in Serbian, but non-finite verbs do so, too, but the argumentation is beyond the scope of this paper. However, the same author (Bošković, 2011) also claims that there are no T(ense)P(hrase) projections in languages that lack the category D(eterminer)P(hrase) (and he argues that Serbian is one such language, given that it has no articles) and that the tense markers in DP-less languages

should consequently be interpreted as markers of mood and aspect, not tense. This approach, which poses problems for the interpretation of some tenses,² could have serious consequences for the Tree Pruning Hypothesis (TPH, Friedmann and Grodzinsky, 1997; Friedmann, 2001) outlined above. Namely, if individuals with Broca's aphasia are assumed to fail to inflect verbs for tense due to the fact that their syntactic representation is pruned at the Tense node, not having a Tense node in languages which lack the category DP calls for a reformulation of the TPH to explain the loss of which bit of linguistic knowledge causes this morphosyntactic impairment.

In terms of the number and type of obligatory clausal elements that are assigned a syntactic function, i.e. the argument structure of verbs, in addition to intransitive (one-place, e.g. *LUKE runs*), transitive (two-place, e.g. *LUKE eats AN APPLE*) and ditransitive (three-place, e.g. *LUKE gives AN APPLE TO LAURIE*) verbs, and the distinction between unaccusative and unergative verbs among intransitives (the former subcategorizing only for an internal argument, the latter only for an external one), Serbian also has anticausative verbs. Unlike unaccusatives (3) and unergatives (4), which do not differ morphologically, anticausatives (5) are always marked with the morpheme *se*, which is not present with their transitive counterparts (6) (Popov, 2013):

- (3) Brod tone.
ship.Theme sink.Pres.3sg
'The ship is sinking.'
- (4) Jovan pliva.
John.Agent swim.Pres.3sg
'John is swimming.'
- (5) Vrata se zatvaraju.
door.Theme *se* close.Pres.3sg
'The door is closing (by itself).'
- (6) Jovan zatvara vrata.
John.Agent close.Pres.3sg door.Theme
'John is closing the door.'

4. VERBS IN SERBIAN APHASIA

Even if for decades in the field of aphasiology there was a clear predominance of studies describing English speaking individuals mostly with Broca's aphasia,

² As Todorović (2012) points out, the past and future tenses use auxiliary verbs which clearly need to check their tense features in TP. However, while past and future tenses in Serbian could be said to be specified for tense features, it is not entirely clear for what feature, if any, the present tense is specified.

clinical cases of Serbian-speaking individuals with different subtypes of aphasia have been described ever since the 1940s (Fabbro, 1999). The level of detail of these accounts is, however, vague, and they are focused mostly on recovery considerations. More recently, new studies have been carried out, offering systematic observations of performance patterns. A number of these studies provide some hints on the degree of preservation of verbs. Such is the case of Zei and Šikić's (1990) study analyzing narratives in two Serbo-Croatian patients diagnosed with Broca's aphasia. Based on these samples, the authors provide a general description of the patients' performance in terms of preserved vs. damaged categories. They document a low number of occurrences of verbs, auxiliaries, and adverbs, and an overuse of infinitives and verbal forms in present tense. The occurrence of other forms such as adjectives, demonstratives, possessives, personal and relative pronouns, prepositions and subordinate conjunctions was also found to be reduced.

Lukatela, Crain and Shankweiler (1988) provide a more exhaustive analysis in their study of six Serbo-Croatian individuals with agrammatism on a test of inflectional morphology in which subjects judged the grammaticality of spoken sentences. The authors reported the subjects' preserved sensitivity to two kinds of syntactic features: subcategorization requirements, that is, the number and nature of the arguments required by a given lexical item, and closed-class morphology, which the individuals in this study were found to be able to process despite frequent omissions and substitutions in their speech. Since it was easier for the subjects to give a correct judgment in the conditions with correct inflection, Lukatela, Crain and Shankweiler (1988) concluded that linguistic knowledge is more difficult to access if the context places heavy demands on working memory, such as those generated by phonological processing (Caramazza, Berndt, and Basili, 1983). The results replicate those in Smith and Mimica's (1984) study of ten Yugoslav individuals with agrammatism and ten controls in the comprehension of agent-object relations in sentences with two nouns and a transitive action verb. These authors also report that thematic-role assignment may be impaired due to the patients' inability to use case information, in addition to their poor use of positional information. Since the use of semantic animacy information is unimpaired, that is since individuals with agrammatism still make use of the contrast animate-inanimate to determine the role of a noun, this may have a favouring effect in correct thematic-role assignment.

The studies presented so far focused on non-fluent aphasias. Interestingly, Kljajević and Bastiaanse (2011) address the issue of a possible dissociation between fluent and non-fluent aphasias. Using the Test for Assessing Reference of Time (TART, Serbian version: Kljajević and Bastiaanse, 2008), the authors investigate the production and comprehension of time reference in four Serbian-speaking individuals with fluent aphasia. The production results show ceiling performance for the present, and relatively spared ability to produce verb forms referring to the future (87.5% correct). However, the production of verb forms referring to the past was found to be impaired. In comprehension, the results show better comprehension

of the present (85% correct) and past (81.25% correct) than the future (63.75% correct). Even if the results indicate a similar pattern to that generally attested in non-fluent individuals, with major impairments in past time reference, the error analysis reveals that the underlying deficit must be different. While non-fluent individuals opt for present forms, that is they substitute past and future referring forms, fluent individuals tend to maintain the correct time reference be it past, present, or future and select a non-target tense inside any of these temporal frames..

Popov (2013) reports the results of a sentence production task with 3 fluent and 4 non-fluent individuals with aphasia, who are native speakers of Serbian as well as of a control group matched with the patients in age, education, and gender. Unergative and transitive verbs were found to be better preserved than unaccusatives and anticausatives in both groups (unergatives: 97.1%; transitives: 87.5%; unaccusatives: 67.1%; anticausatives: 38.3%). Differences emerge regarding the errors that these subjects produce. While non-fluent subjects show a tendency towards the transitivization of non-transitive entries (>25% of errors), which is a manipulation of argument structure, fluent individuals display morphological errors in the form of tense and agreement substitutions and finiteness omission along with omissions of the main verb, which account for over 50% of the errors in this group.

5. DISCUSSION

Taken together, the results discussed in section 4 indicate preserved sensitivity to subcategorization requirements and closed-class morphology (Lukatela, Crain and Shankweiler, 1988). However, a dissociation arises across aphasia types, consistent with what we observed in the Introduction (Miceli, Silveri, Villa and Caramazza, 1984; Zingeser and Berndt, 1990). Individuals with non-fluent aphasias have been found to overuse infinitives, or substitute the target tense by a present form. Reference to the past has been found to be significantly more impaired in these subjects than reference to the present (Zei and Šikić, 1990; Kljajević and Bastiaanse, 2011). Individuals with fluent aphasia also experience difficulties with the production of verb forms that refer to the past. However, non-target responses consist of the correct time reference and the wrong selection of the verb form (Kljajević and Bastiaanse, 2011).

These problems may be ultimately attributed to a failure in discourse linking (PADILIH, Bastiaanse, Bamyaci, Hsu, Lee, Yarbay-Duman and Thompson, 2011). Further evidence for this claim is provided by Zei and Šikić (1990) who, in addition to verbal deficits, also report problems with clitics, which – as past time reference – are discourse-linked. Since the operation of discourse linking increases the need for processing resources both in the case of verbs and in the case of clitics, the PADILIH predicts that individuals with aphasia will experience problems with both forms (Avrutin, 2000, 2006).

With respect to argument structure, Smith and Mimica (1984) report impairment in thematic-role assignment, which is attributed to the patients' inability to

use case or positional information. However, the results in Popov (2013) call for an explanation in terms of the DOP-H. The derived order in unaccusatives makes this type of verbs more susceptible to impairment than unergatives or transitives. With the data available up to date in Serbian, a failure to satisfy linking conditions seems to be the most adequate explanation for verbal deficits. Failure in discourse-linking would account for the morphological deficits, while the derived order of constituents would predict the hierarchy of complexity found in verbs with different thematic grids.

These studies replicate previous cross-linguistic findings. However, the specific characteristics of the verbal system of Serbian make it interesting to further develop this trend of research in search of new sources of data that can not only contribute to a better understanding of aphasia and the subsequent development of more precise assessment and therapy methods, but also to the enrichment of our knowledge about language representation and processing. As an example, studies have shown that individuals with aphasia find it more difficult to name and categorize verbs requiring more arguments than verbs requiring fewer (Thompson, Shapiro, Li and Schendel, 1994; Thompson, Lange, Schneider and Shapiro, 1997), suggesting that verb production is influenced by the syntactically relevant argument-taking properties of verbs (Levin and Rappaport-Hovav, 1995 in Thompson, 2003). However, unaccusatives, whose argument structure triggers a complex syntactic derivation, have also been shown to require more effort to produce than unergatives, which are considered syntactically simple. One of the questions that the Serbian verb system might help to address is how anticausatives fare with respect to the argument structure complexity hypothesis (Thompson, 2003), i.e. how they rank with respect to naming and categorization relative to other intransitive verbs, as well as transitive and ditransitive verbs.

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Silvia Martínez-Ferreiro
Sabina Halupka-Rešetar

ГЛАГОЛИ У АФАЗИЈИ У СРПСКОМ ЈЕЗИКУ

САЖЕТАК

Дефицити у проналажењу речи једна су од карактеристика афазije. Они се у највећој мери читују у категорији глагола, нарочито након оних лезија које резултирају настанком Брокине афазije. Будући да управо глаголи садрже саму срж реченице, истраживања везана за продукцију глагола код популације са афазijом од кључног су значаја не само за разумевање језичких дефицита, већ и за процену стања пацијената и њихову терапију. У овом раду даје се преглед постојећих студија у којима се описује говор популације са афазijом чији је матерњи језик српски, с циљем да се истражи у којој су мери очувани глаголски облици. Улога разних фактора, као што је природа самог глагола, његова аргументска структура и морфолошки експоненти који се на глаголу јављају, анализирају се у раду у светлу различитих хипотеза и теорија која се у литератури износе у чиљу проналажења универзалног објашњења.

Кључне речи: глаголи радње, аргументска, структура, флективна морфологија, српски језик