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Clinical Linguistics in Bosnian / Croatian / Montenegrin / Serbian (BCMS): Down syndrome, Specific Language Impairment and aphasia*

Abstract: The aim of this paper is to give an overview of research in the field of clinical linguistics focusing on several closely related South Slavic languages, namely Bosnian, Croatian, Montenegrin and Serbian (BCMS or Serbo-Croatian). It summarizes studies of genetic, developmental and acquired disorders conducted with participants who are native speakers of one of these languages, including Down syndrome, Specific Language Impairment and aphasia. As studies of language deficits in these four languages are still rather scarce, the paper concludes with a brief discussion and a set of suggestions for future research in the field of clinical linguistics.

Key words: language impairments, clinical linguistics, Down syndrome, Specific Language Impairment, aphasia.

Clinical linguistics is a relatively new discipline, emerging in large part since the late 1970s, which can be defined as “the application of the linguistic sciences to the study of language disability in all its forms” (Crystal, 2001:673). The creation of multidisciplinary research teams for the investigation of language in the past decades has had a direct impact on the field of language pathologies, significantly increasing the number of proposals available in the literature. Studies aimed at investigating clinical populations are a valuable source for the generation and improvement of assessment and treatment methods, but are also crucial to establishing the validity of theoretical linguistic proposals addressing the underlying mechanisms of language processing (Ball & Kent, 1987; Perkins & Howard, 1995). However, there is a striking imbalance in the number of studies carried out in different languages, as well as in the pathologies addressed in these studies. While the bias towards English is clear, studies in BCMS remain scarce. In the following pages, and as a follow up of previous efforts targeting verb deficits in aphasia (Martínez-Ferreiro & Halupka-Rešetar, 2014), we aim at creating a state of the art review, gathering the already existing studies, and locating them in the frame of cross-linguistic literature. Additionally, given the interest of scholars and students at the *3rd workshop in Psycholinguistic, neurolinguistic and clinical linguistic research*, held at the Faculty of Philosophy, University of Novi Sad on April 18th, 2015, we aim at pinpointing specific topics of relevance to be considered for future research. To fulfil this aim, we have selected a number of studies using the following inclusion criteria: published papers and theses (vs. abstracts and unpublished manuscripts) written in English (with the exception of diagnostic batteries). These papers are devoted to the exploration of three main pathologies with very diverse aetiologies: aphasia, Specific Language Impairment (henceforth SLI), and Down syndrome (DS).

The structure of this review is as follows. After a brief introduction to the disorders addressed in the paper (Section 1), we discuss genetic and developmental disorders (SLI and Down syndrome) in BCMS (Section 2). The topic of acquired disorders (aphasia) in BCMS is tackled in Section 3. The article concludes with a brief discussion and a set of suggestions for

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future research (Section 4). Although we aim at characterizing Bosnian / Croatian / Montenegrin / Serbian (BCMS) altogether, in order to preserve geographical information, we keep the labels as included in the original sources of reference. Consequently, different terms coexist along these lines (e.g. Serbian, Croatian, Serbo-Croatian, and Yugoslav speakers).

1. Language disorders addressed in the paper

The first description of a clinical case in the BCMS literature can be found in Dimitrijević (1940/1983; *apud* Fabbro, 1999), who described the case of a multilingual late acquirer of Serbian diagnosed with aphasia after vascular insult. However, despite this early interest, the number of studies targeting language deficits in South Western Slavic languages remains scarce. In what follows, we give a brief description of SLI, Down syndrome and aphasia, the three disorders which are the focus of attention in the next sections.

Despite controversies surrounding the accurate definition and accounts of SLI (see Leonard, 2014, for a review of linguistic and processing accounts of the disorder), this label is still used to describe a heterogeneous developmental disorder characterized by a significant discrepancy between language and non-verbal cognitive performance, in absence of other developmental disorders, auditory loss or acquired brain damage. Hence, the diagnosis of SLI is mainly established by exclusion (Leonard, 2014), and nowadays tends to be taken as a description of a phenotype and probably has multiple biological causes, including genetic factors.

Most typical characteristics of SLI include inconsistent skills across different language domains affecting both production and comprehension that persist over time. In addition to pervasive morphosyntactic deficits, SLI involves problems with the selection and combination of sounds, impoverished vocabulary – including word finding, repetition deficits and deficits in discourse. However, there is variability as for the prevalence of these alterations (Bishop, North & Donlan, 1996; Cohen, 2002; Conti-Ramsden & Hesketh, 2003; Novogrodsky, 2015; among many others). Some attempts have been made to classify different types of SLI (Rapin & Allen, 1983; Friedmann & Novogrodsky, 2008), including lexical (LeSLI), phonological (PhoSLI), pragmatic (PraSLI), and syntactic (SySLI) SLI, mainly affecting naming, repetition of non-words, narrative tasks, and syntactic structures, respectively (Friedmann & Novogrodsky, 2008), while comorbidity with dyslexia is widely reported (Bishop & Snowling, 2004).

Linguistic literature on SLI has been primarily concerned with deficits in grammatical morphology, with omissions of tense and/or agreement argued to be the main characteristic of SLI in English and other Germanic languages (e.g. Rice & Wexler, 1996) and omission of object clitics in Romance (e.g. Jakubowicz, Nash, Rigaut & Gérard, 1998; Gavarró, 2012; Arosio, Branchini, Barbieri & Guasti, 2014). Deficits in complex syntactic dependencies are also reported, especially with the production and comprehension of wh-questions, relative clauses and passives, in all languages studied: English, Italian, French, Greek and Hebrew, among others (e.g. van der Lely & Battell, 2003; van der Lely, 1996; Riches, Loucas, Charman, Simonoff & Baird, 2010; Adani, Guasti, Forgiarini & van der Lely, 2014; Stavrakaki, 2001; Friedmann & Novogrodsky, 2004). Early studies have also reported impairments in reflexive and pronominal binding (van der Lely & Stollwerck, 1997), though more recent studies of English and Hebrew SLI argue for an intact comprehension of binding in this population (Novogrodsky & Friedmann, 2010; Perovic & Wexler, to appear).

Another developmental disorder to be addressed in the context of BCMS is Down syndrome (henceforth DS). DS is a genetic disorder caused by an error in cell division generating

the emergence of three copies of chromosome 21 instead of the usual two (trisomy 21). It is one of the most common conditions involving a learning disability, affecting 1 in 700-1000 babies of both genders. For typical trisomy, IQ is in the moderately to severely impaired range, though wide individual variation has been reported in all aspects of cognitive functioning. Delays of speech and language development are common, however, a strikingly poor linguistic achievement is one of the characteristics of this condition that sets it apart from other genetic disorders (Rondal, 1988; Miller, 1988). Speech intelligibility is reduced by both mechanical problems and inappropriate phonological processes (Dodd, 1976), though concrete vocabulary and word recognition skills tend to be in line general cognitive abilities (Abbeduto, Warren & Conners, 2007). Grammatical morphology seems most affected, with the omission and inconsistent use of both free function words (copulas, auxiliaries, modals, articles, prepositions, pronouns, conjunctions, and infinitive 'to') and bound grammatical morphemes (plural -s, possessive -s, third person singular, contractible auxiliaries and copulas, regular past tense -ed) resulting in short telegraphic utterances in most individuals with DS (Fowler, 1990; Chapman et al. 1998). Studies show that complex syntactic structures such as auxiliary inversion, subordinate clauses, relative clauses and passives are rarely mastered by either children or adults with DS (Fowler, 1990; Bridges & Smith, 1984; Rondal & Comblain, 1996), while deficits in binding have been uncovered in different languages in recent years: English (Perovic, 2004; Ring & Clahsen, 2005); Greek (Sanoudaki & Varlokosta, 2014) and Serbian, as we will see in ensuing sections (Perovic, 2004; 2008).

Leaving developmental disorders behind, aphasia is an acquired language disorder that has been traditionally characterized as the lack of communication by means of words (Trousseau, 1864), including both their spoken and written version. It is due to focal brain injury, i.e. it emerges as a consequence of a lesion to the parts of the brain responsible for language. When damage is located in the left hemisphere, it affects most right-handed people and over 50% of left-handed people. The aetiology of this deficit is diverse, and it may follow from cerebrovascular accidents (of ischemic and haemorrhagic origin), intracranial haemorrhages, wounds and contusions, tumours, brain insults and degenerative deficits such as dementia (Goodglass & Kaplan 1972, 1983; Grodzinsky, 1990; American Speech-Language-Hearing Association, 2016).

According to the Boston classification system (Goodglass & Kaplan 1972, 1983), the term aphasia is an umbrella term that gathers together eight main syndromes (note also the existence of childhood aphasia and primary progressive aphasia, the latter being a consequence of a degenerative process). Fluency is the key to establishing the classification, although comprehension, repetition, and naming skills are also taken into consideration. Among the non-fluent deficits, characterized by displaying impaired production and better preserved comprehension, we find motor (Broca's) aphasia, transcortical motor aphasia, global aphasia, and transcortical mixed aphasias. The fluent deficits include sensory (Wernicke's) aphasia, transcortical sensory aphasia, conduction aphasia, and anomic aphasias.

Consequently, individuals with aphasia may experience problems with any or all of the following skills: production, comprehension, reading, writing and gesturing. Variability across individuals may be observed through recovery patterns. Although on average 25% of patients recover in 3 months, 25% of individuals with aphasia are still severely affected after 6 months (Goodglass & Kaplan, 1972). Severity tends to be related to amount and location of brain damage (Grodzinsky, 1990). Recovery patterns vary in different modalities (production vs. comprehension), and different languages (L1/L2/Ln). Individuals with aphasia may also suffer

from related problems such as motor problems, including dysarthria, apraxia, or swallowing disorders.

The scarcity of data available for South Western Slavic languages is reflected not only in linguistic studies per se, but also in everyday clinical practice. An example can be found in the realm of diagnostic tools. While in the case of developmental pathologies there are a number of tests produced for the assessment of deficits in BCMS (Vladisavljević, Kostić & Popović, 1983; Vasić, 1991; Vladisavljević, 1997; Kovačević, Jelaska, Kuvač & Capanec, 2005; Kovačević, Padovan, Hržica, Kuvač, Mustapić, Dobravac & Palmović, 2010), with the exception of Vasić's (1991) and Kovačević et al.'s (2010) work which includes tests for both infants and adults, no specific tests for diagnosing impairments in adults have been created so far, and those available are, at best, still at different stages of standardization (Smith & Mimica, 1984; Vukovic, Vukovic & Stojanovic, 2010; Vukovic & Stojanovic, 2010).

Vladisavljević, Kostić and Popović's (1983) and Vladisavljević's (1997) works have been used for the diagnosis of SLI and include assessment of spontaneous speech, gathered by means of a story generation task with pictures, and an articulation test, which includes naming and repetition tasks also with picture support (similar to Vasić, 1991). Spontaneous speech samples are analysed relying on measurements of the total number of words, total number of sentences and clauses (to the inclusion of grammatical and ungrammatical sequences), and number of ungrammatical clauses. The articulation test controls for the ability to correctly produce all the sounds of Serbian.

Kovačević et al. (2005) have developed the Croatian version of the *Communicative Development Inventories* (CDIs) (Fenson, Dale, Reznick, Thal, Bates, Hartung, Pethick & Reilly, 1993), the parent report instruments for assessing the language development of infants (8-16 months of age) and toddlers (16-30 months), including vocabulary comprehension, production, gesture use and early grammar. The instrument is also appropriate for the assessment of late language development. Finally, Kovačević et al. (2010) have adapted the *Peabody Picture Vocabulary Test* to Croatian. This test, originally designed by Dunn (1959), assesses receptive vocabulary based on a series of pictures and allows a quick insight into the verbal abilities of infants, although recent versions can also be used in adult populations.

In the realm of aphasia, although verbal and nonverbal cognitive tests are regularly used for diagnosis in BCMS, the specifics of these batteries are not always clear. As an example, Smith and Mimica (1984: 280) mention that "the battery [they use] cover a range of areas comparable to that of the *Boston Diagnostic Aphasia Examination*" (BDAE; Goodglass & Kaplan, 1972, 1983). Although there are Serbian versions of both the BDAE and the *Western Aphasia Battery* (WAB; Kertesz, 1982) (see Lukatela, Shankweiler & Crain (1995) a.o. for the former, and Jovanov (2011) a.o. for the latter), as well as the *Token test* (DeRenzi & Vignolo, 1962) and the *Boston Naming test* (Kaplan, Goodglass & Weintraub, 1983), according to Vukovic, Vukovic and Stojanovic (2010), none of the above mentioned language batteries have been standardized for the Serbian population (or to any other South Western Slavic variety). However, all of them are regularly used in clinical practice, as there are no other measurements available.

However, the field is changing fast for the better. A new Serbian version of the *Token test* has been added to the multilingual i-pad version developed by Bastiaanse, Raaijmakers, Satoer and Visch-Brink (2015). Additionally, the Croatian and Serbian versions of the *Comprehensive Aphasia Test* (CAT; Swinburn, Porter & Howard, 2005) are currently in preparation by Kuvač Kraljević and Kovačević (Croatian) and Vuksanović and Bjekić (Serbian) as part of the ISCH

COST Action IS1208 Collaboration of Aphasia Trialists (CATs). In addition to the previously mentioned tests devoted to assessing languages individually, a culturally and linguistically adapted electronic version of the *Bilingual Aphasia Test* (BAT; Paradis & Libben, 1987), designed to assess each of the languages of a bilingual or multilingual individual with aphasia in an equivalent way, is available in Bosnian, Croatian and Serbian (adapted by Bilanović, Pilković and Milojković, respectively). The language pair-specific tests available are Bosnian-Danish, Bosnian-German (adapted by Kapetanović and Müller), Croatian-English, Croatian-French, Croatian-German (adapted by Kapetanović and Müller), Croatian-Italian, Serbian-English and Serbian-German. The materials can be accessed at <http://www.mcgill.ca/linguistics/research/bat/>).

2. Developmental language disorders in BCMS

In this section, we summarize the existing data on a set of conditions that affect language from the very first stages of its development, and that, consequently, have a direct impact on the process of language acquisition. More specifically, we focus on SLI and Down syndrome.

As Palmović (2007: 55-56) reports, investigations of SLI have generally focussed on language production (Kovačević et al. 1997). Three examples from the speech output of Serbian children with SLI are reproduced below. The sentences in (1) show omission of the reflexive clitic *se* and the auxiliary verb in perfect tense (the grammatical sentences are *Bata SE popeo gore* and *Bata JE pao dole*, respectively). The example in (2) illustrates a syntactically unacceptable structure.

- (1) a. *Bata popeo gore.
The boy climbed up.
b. *Bata pao dole.
The boy fell on the ground.
(2) *Jednog dana kad bile jabuke
one day when were apples
One day there were apples.

(from Vuković & Stojanović, 2011: 191-192)

Ljubesić and Kovacević (1992) first reported the results of a short-term longitudinal study of 61 Croatian speaking children with SLI, aged 7-10. The study tested the contrast between plural and dual formation and the sensitivity to inflection violations. Dual marking on nouns was found to be more compromised than plural marking. As for the accuracy in the identification of incorrect inflections, rates were lower than in age-matched controls. However, the relatively low number of errors overall lead the authors to conclude that 'there is no evidence of general deficiency in acquired morphological knowledge' (p.41) in the SLI group.

Palmović (2007) conducted six ERP experiments in order to gain insight into language comprehension in Croatian in three groups of participants: adults, children with typical language development (TLD) and children with SLI. Regarding the difference between children with TLD and children with SLI, who were tested on case and tense violations, a weak electrophysiological effect or absence of difference was found between experimental conditions and even between experiments. This suggests that children with SLI at least partly fail to detect grammatical errors and, consequently, achieve sentence comprehension using alternative strategies. The differences

noted can be explained in terms of impaired, inefficient, limited or slow processing in SLI children, which is a consequence of slower development rather than lack of linguistic knowledge.

In a recent study, Vukovic, Vukovic and Stojanovic (2010) investigated language and motor abilities in 30 Serbian speaking children with SLI aged 4-7. Language skills were tested by means of a story generation task (Kostic & Vladislavljevic, 1983), the *Token test* (DeRenzi & Vignolo, 1962), the *Boston naming test* (Kaplan, Goodglass, & Weintraub, 1983), and a test of articulation (Kostic & Vladislavljevic, 1983). Motor skills were tested using *McCarthy's scales of children's abilities* (McCarthy, 1972) and the test of imitation of movements (Berges & Lezine, 1972). Results indicated that children with SLI had significantly more difficulties on the language assessments compared to controls, but they also displayed a delayed onset in the development of all motor skills under investigation. Differences between children with SLI and controls also emerged with respect to the language abilities, which were shown to correlate with motor abilities. The results show no significant differences as for the mean number of words produced in picture description or the total number of clauses. However, significant differences appear in the total number of ungrammatical clauses as well as in the Boston naming test, the Token test, and the mean number of incorrectly produced sounds. In addition, children with SLI were found to have accompanying motor deficits. Motor skills involving imitation of complex movements were found to be a significant predictor of expressive vocabulary in individuals with SLI. The emergence of language deficits together with motor deficits coincides with cross-linguistic results, raising the question of how "language specific" SLI is (Bishop, 1994; Leonard, 2014).

Vukovic and Stojanovic (2011) focused on the use of auxiliaries and clitics as well as the production of ungrammatical constructions during a story telling task with picture support in 30 Serbian speaking children with SLI. The results showed significant asymmetries across populations regarding the number of words (14.9 on average in the SLI group vs. 19.4 in the age-matched group), together with a pervasive omission of both auxiliaries and clitics (0.67 on average in the SLI group vs. 0.034 in the control group for auxiliaries, and 0.47 vs. 0 for clitics). As for the presence of deviant constructions, differences across groups also reached significance with no errors detected in the control group (vs. 0.17 in the SLI group). Children with SLI also performed worse than controls on the Token test (DeRenzi & Vignolo, 1962) and the Boston naming test (Kaplan, Goodglass & Weintraub, 1983).

Perovic & Vuksanovic (2012) investigated comprehension of verbal passive in Serbian speaking children with SLI, a complex syntactic structure whose production and comprehension has been reported to present particular difficulty for English-speaking children with SLI. Twenty-eight children with SLI and an equal number of their non-verbal MA-matched controls, aged between 3;04 and 8;08, were tested on a two picture selection task, involving passives of actional (e.g. *push*) and non-actional verbs (e.g. *love*), with and without the by-phrase (i.e. 'long' and 'short' passive). Children with SLI performed no differently to matched control children on control (active SVO) sentences which included either actional or non-actional verbs, and no different on short passives of actional verbs. Though both groups found the comprehension of non-actional passives difficult, this was particularly pronounced for children with SLI, who also performed worse on actional long passives. In line with the literature on English SLI, these data suggest that the process of the acquisition of passives in Serbian SLI closely follows that of typical development, but is significantly delayed.

Compared to SLI, studies of language abilities in other developmental disorders are exceptionally rare in BCMS. In a study on grammatical morphology in Serbian Down syndrome, Perovic (2010) analysed spontaneous speech and narratives elicited by the wordless picture book *'Frog where are you?'* (Mayer, 1969) of six adolescents and young adults with this disorder. The language samples revealed relatively spared morphosyntax in all the participants, though striking difficulties were observed in the use of nominal inflection, as observed in the incongruous gender on nouns and determiners (see examples below).

- (3) ovaj kuće
this-sg-**Masc** puppy-sg-**Neut**
this puppy
- (4) neki rupe
some-sg-**Masc** hole-sg-**Fem**
some hole

Other errors involved difficulties marking subject-verb agreement, i.e. mismatch in number or gender between the subject and the verb, as well as occasional incorrect case on sentential subjects or objects, incorrect case within a PP, as well as preposition omission.

The same participants were tested on their knowledge of binding in Perovic (2004, 2008) where their performance was contrasted to that of English-speaking individuals with DS and non-verbal mental age (MA)-matched typical controls. The task was a picture truth value judgment task, adapted from Chien & Wexler (1990), which elicited yes-no answers to questions matching or mismatching the picture shown. Eight experimental conditions contained sentences aimed to test participants' interpretation of third person singular pronouns in both their strong form (*njega, nju*) and clitic form (*ga, je*), as well as the strong reflexive form (*sebe*) and the reflexive clitic (*se*). Four control conditions involved sentences without any pronominal elements, in order to test participants' attention and general understanding of the task. Good performance was attested in control conditions and experimental match conditions (note that match conditions are considered easier as participants are required to answer 'yes' to questions posed). As for the mismatch condition, accuracy rates for pronouns reached 91%, while reflexives were correctly interpreted only 63.5% of the time. Embedded within the theoretical approach to binding of Reinhart and Reuland (1993), the pattern of good performance on the reflexive clitic (considered a marker of inherent reflexivity) was explained as evidence that participants know the semantic properties of reflexive predicates (i.e. possess the knowledge of conditions on reflexivity as in Reinhart & Reuland, 1993), but their poor performance on the full reflexive, parallel to that observed in English speaking individuals with DS, reveals an inability to establish a syntactic relationship of binding between the reflexive and its antecedent. The overall pattern is taken as evidence against the characterisation of language development in DS as simply delayed, since the pattern of better performance on pronouns and poorer performance on reflexives has not been observed during any stage of typical language development (see Perovic, 2016).

3. Acquired disorders in BCMS

The label "acquired language disorders" is generally used to refer to a set of pathologies that appear abruptly once the course of language acquisition has finished. Acquired disorders,

and more specifically aphasia, are amongst the most widely investigated deficits in BCMS, as evidenced by the publication in 2010 of the 2nd edition of the manual *Afaziologija* by Vukovic, written in Serbian. This bias is more evident when it comes to the characterization of verbs, the category accumulating more attention. An example of the spontaneous speech of an individual with a non-fluent aphasia is reproduced below:

(5) Pa... mama briše tanjir.

Well... mama is drying the plate.

De... dečko... kolači... devojčica uzmi uz..uzima...

The b..boy... cookies... the girl take ta.. is talking...

Voda curi.

The water is leaking.

(Cookie theft description – BDAE: Goodglass & Kaplan 1972, 1983 – from Lukatela, Crain & Shankweiler, 1988: 193)

The first documented case of an acquired aphasia is in fact a description of childhood aphasia in a bilingual child (Bouquet, Paci & Tuvo, 1981). Bouquet, Paci and Tuvo (1981) describe a patient aged 4;4 who was already fully bilingual (Italian-Croatian) at the time he suffered severe cranial trauma. Although the child started uttering words in Italian a month after the trauma, his inventory of Croatian was reduced to only two words (*nos* ‘nose’ and *trešnje* ‘cherries’). Six months after the trauma, he was found to have recovered Italian completely. The only residual sign of aphasia was a mild uncertainty in using Croatian (Fabbro 1999: 175).

Leaving childhood aphasia behind, the first general description of preserved vs. damaged categories in the speech output of adult individuals with non-fluent aphasic deficits in Serbo-Croatian traces back to Zei and Šikić’s (1990) analysis of narratives in two Croatian participants with Broca’s aphasia as a consequence of an aneurysm and a trauma. The authors document a low number of occurrences of verbs and adverbs (15.9% and 3.8% of the correctly supplied forms, respectively), in addition to the simplification of consonantal clusters and phoneme substitutions. In contrast, there is an overuse of nouns (42.8% of all the words correctly supplied by S01) and nominative case (63% of inflected forms used by S01), 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.

Focusing on inflectional morphology in non-fluent aphasias, Lukatela, Crain and Shankweiler (1988) provided a more exhaustive analysis of six Serbo-Croatian-speaking individuals with agrammatism of different aetiological origin. Based on a grammaticality judgement test, the authors reported the subjects’ preserved sensitivity to the subcategorization requirements of transitive and intransitive verbs and closed-class morphology, with results uncontroversially above chance level. In the grammatical condition, the group supplied 94.5% and 91.3% correct answers for transitive and intransitive verbs, respectively. The number of errors was shown to increase slightly in the ungrammatical condition, with 89.5% correct for transitive and 86.3% correct for intransitive verbs. A consistent favouring effect was found towards transitive forms. These results replicated those in Smith and Mimica’s (1984) study of ten Yugoslav individuals with agrammatism in the comprehension of agent-object relations in sentences with two nouns and a transitive action verb.

Smith and Mimica (1984) 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. In a study on comprehension of simple declarative sentences, individuals with Broca's aphasia assigned the Agent role to the first noun in 68% of the nominative-accusative items, and in 46% of the accusative-nominative items. Since the use of semantic animacy information is unimpaired in this population, 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.

Couching their findings within Grodzinsky's (1984, 1986, 1990) proposal that the cause of comprehension deficit in agrammatism is due to partial loss of syntactic knowledge, Milekić, Bošković, Crain and Shankweiler (1994) investigated the sensitivity to traces and the knowledge of the inflectional and determiner system in a group of eight native speakers of Serbo-Croatian with Broca's aphasia with agrammatism, performing a grammaticality judgement task. The findings of this study are in accordance with previous studies: grammatical constructions were easier to identify than grammatical violations, although both conditions were completed above chance (95.2% vs. 85.4% correct, respectively). These results go against the general claim that the content of functional elements is lost in agrammatism, and point towards less restrictive proposals such as those based on processing demands (Caplan, 2006). However, despite high accuracy rates, different tendencies across constructions have been documented in the ungrammatical condition. Ungrammatical sentences involving a non-nominative subject (6a) and violations of SV agreement (6b) were detected in 81.25% of the cases, while vacuous quantification (7) and violations related to (agreement mediated with) NP-traces (8) were more difficult to perceive (with 73.75% and 72.5% correct answers, respectively). This indicates that agreement features and tense specification may prevail in comprehension, together with sensitivity to case violations with nouns and determiners and the capacity of binding a wh-phrase with a variable (a wh-trace).

- (6) a. *Mušteriju je udarila prodavačicu.
customer-Acc hit saleswoman-Acc
b. *Direktor kažnjavaju učenike.
principal-3sg punish-3plPres pupils
- (7) a. *Ko doktor leči pacijenta?
who-Nom doctor is treating patient-Acc
b. Koga, doktor leči t_i?
who-Acc doctor-Nom is treating
- (8) *Komšija; moraju t_i biti dobri.
neighbour-3psg must-3pl be good-3pl

In a related study, Lukatela, Shankweiler and Crain (1995) tested the comprehension of Serbo-Croatian speaking agrammatic aphasics on four types of relative clause structures and on conjoined clauses. The relative clauses varied in type of embedding (embedded vs. non-embedded) and in the location of the gap (subject position vs. object position). There were two control groups, subjects with Wernicke-type aphasia and non-brain damaged subjects. The findings from a sentence-picture matching task indicated that individuals with agrammatic aphasia were able to process complex syntactic structures, as evidenced by their well above-chance performances. The success rate varied across different types of relative clauses, with

object-gap relatives yielding more errors than subject-gap relatives in all groups. The error pattern was the same in all three groups, the subjects with agrammatism being distinguished from the other two groups only in the quantity of errors. Again, Lukatela et al.(1995) claim that these findings are incompatible with the view that individuals with agrammatism are missing portions of the syntax. Instead, their comprehension deficits are argued to reflect varying degrees of processing impairment in the context of spared syntactic knowledge.

Kljajevic and Murasugi (2010) focused on comprehension of wh-dependencies in Croatian, reporting the results of three individuals with Broca's aphasia and three individuals with mixed aphasia in an act-out task. Contrary to most cross-linguistic findings, no asymmetries were detected in this study regarding the contrast between subject and object questions with *tko* 'who' and *koji* 'which' in the performance of individuals with Broca's aphasia, and those in the mixed group performed better on object than on subject extracted questions. This is attributed to the role of morphological information in free word order languages. However, contradictory results can be found in the literature (cf. Jovanov, 2011 below).

Finally, Jovanov (2011) reports the performance of two Serbian-Greek bilingual speakers with Broca's aphasia in sentence-picture matching, an act out task, grammaticality judgement and sentence repetition in order to observe word-order comprehension (canonical vs. non-canonical constructions) in discourse and non-discourse related structures. Additionally, she includes results from a third (monolingual Serbian-speaking) individual in a sentence-picture matching task with semantically reversible sentences (e.g. *The cat that the dog is chasing is black*, where the correct interpretation relied on syntactic structure only, unlike *The ball that the boy is kicking is red*, which provides semantic cues for interpretation). Focusing on Serbian alone, on average, in the first sentence-picture matching task that included left and right object dislocations, focus structures, subject and object restrictive relatives with or without modifiers (see examples below), the first two participants performed below chance with focus (19% correct), S-O (8.5% correct) and O-O structures (8.5% correct), and at or above chance with dislocations (50% correct), S-S (75% correct) and O-S structures (41.5% correct).

- (9) a. Starica prati nju, ženu. (right dislocation without modifier)
 old woman-Nom follow-3sg her-Pr woman-Acc
The old lady is following her, the woman.
- b. Muškarca s kišobranom, njega gura policajac. (left dislocation with modifier)
 man-Acc with.umbrella him-Pr push-3sg policeman-Nom
The man with an umbrella, the policeman is pushing him.
- c. Starica šuta DEVOJČICU SA SLADOLEDOM. (focus structure with modification)
 old.woman-Nom. kick-3sg girl-Accwith.ice cream
The old woman is kicking the GIRL WITH THE ICE-CREAM.
- d. Medicinska sestra šuta devojkku koja drži tašnu. (subject restrictive relative)
 nurse-Nom kick-3sg girl-Acc who-Nom.f hold-3sg bag-Acc
The nurse is kicking the girl who is holding a bag.
- e. Policajac koga pozdravlja žena ljubi staricu. (object restrictive relative)
 policeman-Nom who-Acc.m greet-3sg woman-Acc kiss-3sg old.woman-Acc
The policeman that the woman is greeting is kissing an old lady.

The second picture-matching task compared dislocations and focus. The performance of one additional individual with Broca's aphasia showed an asymmetry between SVO and OVS

constructions in addition to an effect of the presence of clitics vs. strong pronouns in the dislocation condition. The monolingual Serbian speaker with aphasia (SA3) produced 75% correct responses in SVO dislocations with clitics as opposed to 95% correct responses in SVO dislocations with full pronouns (10a), while his accuracy rates decreased for OVS constructions (45% correct with clitics vs. 50% correct with full pronouns, (10b)). The SVO – OVS effect was also shown to hold in the focus condition, with 95% correct responses for SVO compared to 60% correct responses for OVS (10c).

- (10) a. Starac je šuta, staricu. (S-Cl-V-O) vs. Starac šuta nju, staricu. (S-V-Pr-O)
 old man-Nom her-cl kick-3sg old.woman-Acc
The old man is kicking her, the old woman.
 b. Policajca, gleda ga devojka. (O-V-Cl-S) vs. Policajca, njega gleda devojka. (O-Pr-V-S)
 policeman-Acc look-3sg him-cl girl-Nom
The policeman, the girl is looking at him.
 c. Devojka pozdravlja STARCA. (S-V-O) vs. STARCA pozdravlja devojka. (OVS)
 girl-Nom greet-3sg old man-Acc
The girl is greeting the OLD MAN.

Taken together, the sentence-picture matching tasks revealed general above chance performance on constructions in canonical (SVO) order. Theta-role reversal was found to be by far the most frequent error type in OVS. The level of performance was found to be low on object relatives, but impairment was also found in subject relatives.

Contrary to Kljajevic and Murasugi (2010), in the prompted act out-task with subject and object questions Jovanov (2011) found a dissociation between *who* and *which* questions (92.5% correct vs. 47% correct, respectively) in the performance of two individuals with Broca's aphasia. Additionally, while canonical wh-questions were produced 78% correct, their non-canonical equivalents turned out to be more problematic, as they were correctly produced only 61.5% of the time.

The grammaticality judgement and the sentence repetition tasks were aimed at observing whether individuals with aphasia comprehend and produce case and S-V agreement in grammatical and ungrammatical constructions. Although accuracy rates were similar across tasks for grammatical sentences, a task dependency effect can be observed in the ungrammatical condition, with sentence repetition leading to a higher number of errors. The results of the two participants across tasks are reproduced in Table 1 below:

Table 1: Average accuracy for repetition and grammaticality judgement in two individuals with Broca's aphasia.

Grammatical sentences	SVO (agreement)		VOS (agreement)		SVO (case)		VOS (case)	
	%	n=16	%	n=16	%	n=16	%	n=16
RT	75	(12/16)	25	(4/16)	97	(15.5/16)	44	(7/16)
GJ	78	(12.5/16)	47	(7.5/16)	97	(15.5/16)	56	(9/16)
Ungrammatical sentences	SVO (agreement)		VOS (agreement)		SVO (case)		VOS (case)	
	%	n=16	%	n=16	%	n=16	%	n=16
RT	0	(0/16)	34	(5.5/16)	0	(0/16)	15	(2.5/16)
GJ	100	(16/16)	97	(15.5/16)	100	(16/16)	94	(15/16)

RT: repetition task; GJ: grammaticality judgement

(Jovanov, 2011: 302)

In line with Milekić et al.(1994), participants in Jovanov's study achieved mostly above chance performance in the grammaticality judgement task indicating retained ability to recognize S-V agreement and/or case marking errors. In the sentence repetition task, accuracy rates were shown to decrease with greater difficulties in the repetition of ungrammatical constructions. Altogether, there is significantly better performance on SVO than on VOS clauses.

Summing up, studies of BCMS speakers with non-fluent aphasia reveal short utterances with a strong preference for canonical structures and lost patterns of intonation. While lexical categories and sensitivity to closed-class morphology and subcategorization requirements in comprehension are better preserved (e.g. nouns, nominative case, infinitives), there are consistent problems with inflected elements (e.g. tense, with the present as the better preserved form) and with free standing functional elements (e.g. clitics). Thematic-role assignment is affected by the patients' inability to use case information and their residual use of positional information, with animacy and convergence of cues showing favouring effects. However, comprehension and grammaticality judgement skills indicate that the content of functional elements is not lost. As for the contrast between *who* and *which* questions, binding a wh-phrase with a wh-trace is still possible in cases of non-fluent deficits. Regarding wh-dependencies, and despite contradictory results, variability is found across non-fluent syndromes with no subject-object asymmetries in the case of individuals with Broca's aphasia and object questions better preserved in cases of mixed aphasia. Linguistic knowledge seems to be less accessible in complex contexts that place heavy processing demands and heavily rely on working memory (Smith & Mimica, 1984; Lukatela, Crain & Shankweiler, 1988; Milekić, Bošković, Crain & Shankweiler, 1994; Zei & Šikić, 1990; Kljajević & Murasugi, 2010; Jovanov, 2011). With the exception of wh-dependencies, which need to be further investigated, this view is consistent with the traditional patterns attested cross-linguistically (Goodglass & Kaplan, 1972, 1983; Miceli et al., 1984, 1989; Grodzinsky 1990; Menn & Obler, 1990; Thompson, Shapiro, Li & Schendel, 1994; Thompson, Lange, Schneider & Shapiro, 1997; Thompson, 2003; Caplan, 2006; among many others).

The studies presented so far focused on non-fluent aphasia. Interestingly, Kljajević and Bastiaanse (2011) address the issue of a possible dissociation between fluent and non-fluent aphasia. Using the *Test for Assessing Reference of Time* (TART, Serbian version: Kljajević & Bastiaanse, 2008), the authors investigate the production and comprehension of time reference in four Serbian-speaking individuals with fluent aphasia. Similar to individuals with non-fluent aphasia, the production results show ceiling performance for the present verb forms 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 are better for the present (85% correct) and past (81.25% correct) than the future (63.75% correct). Differences emerge in terms of the error pattern. While non-fluent individuals produce within-time-frame errors with non-past reference, out-of-time-frame errors are attested for reference to the past. On the contrary, fluent individuals tend to maintain the correct time reference, be it past, present or future and select a non-target tense within any of these temporal frames.

Fluent and non-fluent populations have been directly compared by Popov (2013), who reports the results of a sentence production task with three fluent and four non-fluent individuals with aphasia, all of whom are native speakers of Serbian. 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%). As in Kljajević and

Bastiaanse's (2011) study, the differences mainly reduce to the error pattern. 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. This asymmetry between fluent and non-fluent individuals is consistent with other cross-linguistic observations (Miceli, Silveri, Villa & Caramazza, 1984; Zingeser & Berndt, 1990).

Some studies have specifically focused on recovery patterns. Vukovic, Vuksanovic and Vukovic (2008) describe the recovery patterns and the correlation of language and cognitive functions in patients with post-traumatic language processing deficits (n = 37) and in patients with aphasia following a stroke (n = 34). The data gathered in the acute phase and 6 months later indicate that patients with post-traumatic language processing deficits display a different recovery pattern and a different pattern of correlation between language and cognitive functions compared to patients with aphasia following a stroke, with significantly better recovery and greater correlation within language and cognitive functions, and language functions and other aspects of cognition in patients with post-traumatic language processing deficits. Individuals in this group performed significantly better in sentence repetition and higher verbal fluency tasks and in short-term and long-term verbal memory tasks. Focusing on individuals with aphasia alone, in the acute phase not all language functions were found to be interrelated (e.g. mean score for verbal fluency of 2.18 vs. 14.88 for naming), and language functions were not tightly correlated with the tested cognitive functions (e.g. mean score for reasoning ability of 25.38 in the acute phase). However, language functions and short-term verbal memory (mean score of 1.5 and 5.09, respectively across phases) have been found to correlate, pointing towards the specific role of memory in the recovery of language functions in individuals with aphasia. Although the study allowed for a better understanding of the relationship between language and cognitive functions, as well as a better understanding of the factors influencing recovery, its major shortcoming was that the sample included patients with very diverse lesions and diagnoses, which may have prevented the emergence of more fine grained correlations in this group.

4. Discussion and suggestions for further research

For the most part, the studies on BCMS speakers with developmental or acquired disorders reviewed in sections 2 and 3 replicate previous cross-linguistic findings. As observed in section 1, despite an increasing tendency to characterize typologically different languages, the traditional literature includes mostly results from Romance and Germanic languages (English, French, and Italian). Research on language in clinical populations in South-Western Slavic varieties will thus further contribute to the literature on language in disordered populations that seeks to reveal facts about the language faculty that ordinary linguistic inquiry cannot. Moreover, these languages may be crucial in providing evidence for previously existing, or even competing, hypotheses about linguistic competence of these populations (e.g. as in the reviewed study on binding in Serbian Down syndrome).

To further advance the field, it is necessary to overcome hurdles such as the lack of descriptions of linguistic phenomena that rely on current theoretical frameworks in these languages, lack of data on stages of linguistic development in TD children to allow comparisons to disordered populations, and of course the lack of standardized tests of linguistic abilities that can establish levels of typical functioning during different stages of linguistic development.

With regard to linguistic topics for further research, the verbal system of BCMS looks most promising, as suggested in Martínez-Ferreiro and Halupka-Rešetar (2014). Deficits with the production of verbs are common to different developmental and acquired disorders (e.g. SLI and aphasia). Since verb production seems to be influenced by syntactically relevant argument-taking properties of verbs (Levin & Rappaport-Hovav, 1995 *apud* Thompson, 2003), one of the questions that the BCMS verb system might help to refine is how anticausatives (*Vrata su se otvorila*. 'The door has opened.') 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. Among other linguistic particularities of the Slavic varieties which deserve further investigation are the following: the fact that word order variation does not affect truth value, apparent case marking optionality, wh-movement and multiple wh-questions, as well as the issue of ordering of wh-phrases and the question of exhaustivity, wh-extraction, agreement in coordinated phrases, clitics, argument structure, voice and morphosyntactic operations, negation, among others. Research is also needed regarding the effect digraphia may have on processing in Serbian and its connection with deficits in writing and pathologies related to writing, such as dyslexia. Needless to say, research into language disorders in BCMS also faces the challenge of standardizing numerous research tools and instruments which will help develop more effective assessment and therapeutic methods. We hope that some of these gaps will be filled in future editions of the Novi Sad workshop on *Psycholinguistic, neurolinguistic and clinical linguistic research*.

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