UDK: 159.95:81'367	Godišnjak za psihologiju, vol 6, No 8., 2009, pp.7-22	ISSN 1451-5407

Vanja Kljajević,
Institute of Cognitive Science, Carleton University
Ottawa, ON, Canada[1]

SKIPPING THE LEXICON? FROM SYNTAX TO CONCEPTUAL KNOWLEDGE

Abstract

This paper examines the cognitive underpinnings of a sentence comprehension strategy used by an anomic patient, ST. Curiously, although ST's comprehension of complex syntactic structures such as relative clauses, passive constructions, and wh-dependencies were at ceiling, very often she was unable to correctly name or point to the objects referred to by the nouns in tested structures. Dissociation of syntax and the lexicon in ST indicates that there must be a mechanism connecting syntax to conceptual knowledge, which functions even when concepts fail to 'translate' into words. One hypothesis explored in the current paper is that ST's comprehension strategy is based on syntactic cueing via grammatical functions of nouns, even though nouns are semantically problematic for her. Another hypothesis is that ST combined available linguistic information with her perception of visual scene of enacted sentences, which taken together allowed her to access the conceptual information while skipping the lexicon.

***Keywords**: anomia, conceptual knowledge, syntactic cueing, representational modularity, interface modules.*

[1]vanja.kljajevic@yahoo.ca

Introduction

Sentence comprehension is a complex process that relies heavily on temporal integration of information represented both linearly, as a sentence unfolds in time, and hierarchically, as features belonging to different levels of linguistic structure combine in real time. The variety and amount of information to be synchronously processed for successful sentence comprehension require resources in working memory and attention. At the same time, the complexity is supported by the conceptual, grammatical, and perceptual components. One hallmark of current research on aphasic patients' spoken sentence comprehension is that it often neglects the possible impact of visual scene on auditory comprehension, despite the research indicating its relative importance in on-line sentence processing in neurologically intact populations (Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995; Knoeferle, Crocker, Scheepers, & Pickering, 2003). For example, Knoeferle et al. (2003) have shown that anticipation of thematic roles (“who did what to whom”) is possible in on-line comprehension of sentences with syntactic and thematic ambiguity when depiction of agent-action-patient events is present. Thus, although reliance on auditory processes in sentence comprehension is preferred, a visual scene also provides information that may lead to syntactic and thematic roles disambiguation (Knoeferle & Crocker, 2004).

Interaction between the auditory and visual processes in comprehension of spoken language is also relevant to research on aphasia, given that majority of aphasic patients exhibit intact visual processing regardless of the type of their language disturbances. Most research on aphasic populations' comprehension abilities is conducted in experiments with visually presented materials (e.g., act-out tasks, sentence-picture matching, or tasks relying on reading abilities). Since the visual component of these experiments is often neglected (Kljajevic, 2005), it is not clear at the moment whether or how much aphasic patients rely on visual processing in speech comprehension in a situation when speech refers to some element of the visual scene (i.e., objects, their relations, actions). Thus, the role of perception of visual scene in sentence comprehension in aphasia has not been explored to a great extent so far, even though such research may provide useful insights into the dynamic interplay among the grammatical, conceptual and perceptual components contributing to comprehension processes. Such insights could then inform rehabilitation practices.

In this paper I adopt Zeki's (2003) hypothesis on asynchronous perception, exploring also the idea that temporal hierarchies within the visual and auditory systems may enable their respective attributes to participate in concept formation via inter-systemic attributes binding. In addition, I adopt a more general view that object representations draw from different sensory modalities and that these different modalities are equal contributors to the concepts in semantic memory (Adams & Janata, 2002). Furthermore, I hypothesize that attributes of a concept are available as knowledge on perceptual attributes in cases of atypical across-domain attributes-binding. One aspect of the visual scene's impact on auditory comprehension is reflected in extraction of the relevant non-linguistic elements from the visual environment that afford information about objects and events in it, i.e. object and event affordances (Knoeferle & Crocker, 2004). In order to develop the idea that these affordances might be employed in recovery of (at least some aspects of) speech comprehension in aphasic populations, we need to first establish a theoretical framework that could allow some interaction among presumably completely independent cognitive domains such as vision and language. An example of such framework that appears to be capable of explaining the nature of interactive processes in speech comprehension is based on Jackendoff's (1997, 2002) concept of representational modularity.

Representational modularity situates language in a "more general theory of mental representation", connecting it with processing (Jackendoff, 1997). It differs from the original version of the modularity hypothesis (Fodor, 1983) in postulating two types of modules: integrative modules, which integrate information within a particular level of representations, and interface modules, which communicate information among the integrative modules (Jackendoff, 1997, 2000, 2002). Comprehension of complex syntax requires involvement of some sort of cognitive interfaces operating among different components within the language system, as well as the interfaces between the language system and other cognitive components. The basic assumption of the current paper is that spoken language comprehension may rely on such interfaces more than previously assumed. Depending on the context, spoken language comprehension may rely on the information extracted from a visual scene, when it is available. In the next sections I discuss the idea that elements of a visual scene may affect some aspects of auditory information conveyed by speech, when elements of speech refer to that visual scene. In addition, I discuss the possibility that thus extracted information combines with syntactic information in providing a comprehension strategy in ST. Before I turn to these ideas, a brief case illustration is in order. The goal of this paper is not to present the case of ST in full detail, because it has been presented elsewhere (Kljajevic, 2005). Instead, the case is an illustration of a possible point of departure in our discussion of the relations between the lexicon, conceptual knowledge, and grammar in the mind.

The Case of ST: Brief Description

S.T. is a 57-year-old right-handed Croatian speaking female with 12 years of education who had an ischemic stroke 9 months prior to the participation in a study on comprehension of complex syntax (Kljajevic, 2005). ST had had a history of arterial hypertension and was admitted to the hospital due to severe headache, numbness and weakness of the right limbs, severe disturbance of vision (the right eye) as well as motor and somatosensory disturbances. Profound memory loss, speech disturbances, spatial disorientation, confusion and sleepiness were additional symptoms in this patient. On examination, right hemianopia and the right-side facial paresis (the facial nerve was affected) were found. An MRI scan showed an ischemic infarct lesion in the left posterior cerebral artery (PCA). She was also diagnosed with the partial Gerstmann syndrome (dyslexia, dyscalculia) and aphasia.

The lesion site and the symptoms exhibited at the onset of disease, together with language related disturbances she had shown indicated that she had had a transcortical sensory aphasia. However, at the time when she participated in the experiments, which is approximately nine months from the onset, the aphasia had obviously reduced to anomia. At the moment of testing, apart from anomia, she exhibited other aberrations, such as semantic memory disturbances, manifested as islands of lost knowledge (inability to remember names of fruits, plants, cars, types of sports, meaning of traffic signs, etc.). Her spontaneous speech was fluent, with some circumlocutions and verbal paraphasias. She produced sentences with a flat tone. During the first several months after her stroke, she was not able to sing, of which she was not aware: "I though I was singing, but I was only speaking." ST was also prone to "losing the thread" in communication, constructing an incoherent discourse, and was not able to conduct parallel actions (e.g., writing down a message while talking on the phone).

ST's performance on digit span (WAISR- Weschler, 1981) was 8/14, and her result on the Raven Coloured Progressive Matrices test (Raven, 1976) was 34/ 36. Her performance on the portions of the Boston Diagnostic Aphasia Evaluation (BDAE) (Goodglass & Kaplan,1983) was also very good. Curiously, although her comprehension of complex syntactic structures such as relative clauses, passive constructions, and wh-dependencies were almost at ceiling, very often ST was unable to correctly name the toy animal referred to by a noun in an enacted sentence.

It is interesting to explore the functioning of the regained lexical and conceptual knowledge of a previously lost category (in this case animal names) in the context of comprehension of complex syntax. ST was tested on sentences of various degrees of complexity (relative clauses, direct, embedded, long-distance, and passivized wh-questions) in an act-out task with toy animals. (Examples of stimuli include structures such as: *Who kicked the giraffe?, Which lion did the tiger push?*) There were always three animal figurines in the act out task and the patient was required to point to the toy animal that in her opinion represented the correct answer. When asked to name one of three animals enacting the sentence that she accurately comprehended (e.g., "Which animal is this"?), she often had a difficulty, typically mixing the concepts such as *lion* and *tiger*, *horse* and *deer*, *zebra* and *giraffe*. Where do these errors come from? And what mechanism enables accurate sentence comprehension in the face of naming impairment?

The finding that sentence comprehension is preserved in this patient despite her naming problem is explained in terms of processing compensation. More specifically, even though the representational devices fail to construct lexical knowledge due to the patient's inability to temporally integrate mental representations necessary for that lexical knowledge, her sentence comprehension was enabled by a cognitive strategy. ST's strategy resulted from an individual adjustment to the naming deficit, probably relying on syntactic cueing. Other examples of cueing as comprehension aid have also been reported in the literature, such as prosodic (Strelnikov, Vorobyev, Chernigovskaya, & Medvedev, 2006), case (Kempe & MacWhinney, 1999), and other types of cueing (Silva-Pereyra, Conboy, Klarman & Kuhl, 2007). Thus, what is interesting about ST is not the fact that she used a cognitive strategy to aid sentence comprehension, but rather the mechanisms that made that particular strategy work.

Syntactic Cueing

The fact that ST's sentence comprehension was almost at ceiling in spite of her naming deficit can be explained in terms of syntactic cueing. Note that ST was tested on syntactic structures with only two types of thematic roles – Agent and Patient. Thus, the case ending on the noun phrases (NPs) in tested sentences unambiguously indicated grammatical function of NPs, which in turn indicated their thematic roles. For example, Nominative in *Koja zebra$_i$ je t_i gurnula lava?* indicates the grammatical function of subject and is associated with the thematic role of Agent. Similarly, Accusative as in *Koga$_i$ je zebra gurnula t_i?*, indicates the function of object and is associated with the thematic role of Patient. The inflectional endings that conveyed the information on grammatical functions of NPs therefore serve as reliable predictors or cues of thematic roles. Thus, after encountering a case-marked wh-word (*koja zebra, koga)*, the parser can immediately determine grammatical function of the dislocated wh-word (e.g., *koga*) and predict its gap (marked by *t* in the example above), without resorting to the syntactic information conveyed by the distance between the moved element and its trace, as in English. ST's strategy could be explained by relying on these cues to recognize thematic roles and comprehend "who did what to whom" in tested sentences.

On the other hand, ST's high scores on comprehension of complex syntax can also be explained in terms of combination of the strategy relying on the syntactic cues and their indication of intra-sentential relations with her recognition of visually presented actions. Action-object (i.e., verb-noun) processing is associated with a double-dissociation pattern in aphasic speakers. Cross-linguistic evidence obtained from a variety of cross-modal tasks indicates that anomic and Wernicke's aphasics have spared ability to process words naming actions (so the verb category is intact), while their ability to process words referring to objects (which is the grammatical category of nouns) is impiared, whereas Broca's aphasics display the reverse pattern of noun-verb processing (e.g., Shapiro & Caramazza, 2003). Note further that in addition to word processing impairment according to grammatical category, as exemplified by the noun-verb double dissociations, the neuropsychological literature also reports on impairments with dissociations related to semantic category. As an example, Warrington & Schallice (1984) suggested word-processing dissociation according to whether an object belongs to a living vs. non-living category. Some other researchers pointed out the importance of semantic and physical features of items, with the most recent proposals focusing on the general impact of the sensorimotor dimensions on word processing (Arevalo, Perani, Cappa, Butler, Bates & Dronkers, 2007). For example, theories of sensorimotor meaning organization, which are based on Embodiment Theory, argue that the semantic and sensorimotor properties are critical in the organization of semantic knowledge, which can be reflected in the patterns of language breakdown. According to this view, processing of action and object concepts involves a network of areas on the sensory and motor strips regardless of whether an action is produced by us, or by others and we only observe their performance of the action, or not produced at all but only imagined by us (Fadiga & Craighero, 2006; Fadiga, Destro, Finos, Cotillon-Williams & Smith, 2006). It has been suggested recently that semantic and sensory-motor properties of a concept may be organized in the brain in a way that differs from the traditional view. In general, currently influential theories on the representation of conceptual knowledge in the mind may roughly be divided into embodied and disembodied theories. While embodied theories of conceptual representation reduce conceptual content to sensory-motor content, according to disembodied theories the sensory-motor information is insufficient to fully represent a concept (Mahon & Caramazza, 2005). Without going into any further details on the two types of theories, it will suffice for the purposes of this paper to keep in mind that semantic information processing may be more tightly connected with the processing of perceptual and grammatical information than traditionally assumed.

Perceptual or conceptual breakdown?

A basic three-stage model of object recognition and naming consists of the following stages: the perceptual stage, which activates access to the semantic system, which in turn activates the phonological output lexicon (Hillis & Caramazza, 1995; Funnell & Hodges, 1996). In other words, in a naming task we first recognize an object as a familiar thing, then we activate semantic knowledge on that object and use the semantic information to find its name in speech production (Barry & McHattie, 1994). In addition to these basic processing components, there are perceptual processes taking place before object recognition, and also other processes that are involved in articulation. Impairment at any of these processes may cause anomia, that is *naming* or *word-finding difficulties* associated with a wide range of brain disorders/ diseases such as aphasia, Alzheimer's disease, semantic dementia, encephalitis following herpes simplex, etc. According to the basic three-stage model, ST's inability to correctly name the toy animals is probably due to a breakdown at either the perceptual or semantic/ conceptual stage. Since her repetition and naming to confrontation were at ceiling in a pretest session, and her naming difficulty resulted in semantic coordinate errors, the possibility that problems at the phonological output lexicon stage caused her naming deficit is excluded.

Naming tasks, including naming to confrontation, generally require activation of semantic information about the object that a patient is required to name. If the concepts underlying words are impaired, then naming impairment is predictable. Mental representations of objects in semantic memory are likely to be based on information from multiple sensory domains (Adams & Janata, 2002). How is this information organized in the mind? Research so far has shown that there are two processing streams for "what" (or the ventral stream, involved in fine analysis) and "where" (or the dorsal stream) in the visual (Oliver & Thompson-Shill, 2003), auditory (Adams & Janata, 2002; Kaas & Hacket, 1999), and tactile (Reed, Klatzky & Halgre, 2005) object recognition. Is it possible that ST's processing of visual objects is affected at the level of fine analysis of features, but not at the level of general encoding of the visual scene and motion? One possibility is that ST's recovery of conceptual knowledge and her naming ability progressed in such a way that the last to be recovered were the finest features of objects (e.g., those differentiating a lion from a tiger, zebra vs. giraffe, horse vs. deer, etc.). Not having access to these features could explain ST's naming problem.

Visual perception matters

One argument for the importance of vision in our mental lives and its possible influence on speech comprehension when speech refers to the visual scene could begin with the fact that the visual system has approximately "twice as many cortical areas as the auditory or somatosensory systems" (Kaas & Hacket, 1999). But how exactly the visual areas may contribute to linguistic interpretative processes is a controversial issue. As a first approximation, the visual processes may contribute to language comprehension by providing information extracted from the visual scene, even though they are functionally independent of the auditory processes associated with particular speech stimuli. The extracted information on objects and actions in a visual scene is then transformed into conceptual representations. Similarly, the auditory information contained in spoken language is also represented at the level of conceptual structure as speech unfolds in time. In that sense, conceptual representations are polymodally informed. Our knowledge of objects draws from different sensory domains. Each of these domains assigns a set of features to a concept. Thus, information about a particular object is extracted from different modalities, and it is polymodal (Adams & Janata, 2002). Yet, although polymodal in nature, that information is *represented* in the mind as an amodal, abstract structure – the conceptual structure. If it were not represented amodally, its content would not be available to different cognitive and perceptual components. In other words, if it were a polymodal representation, processing would be limited to a domain-specific computational fluency (i.e., information extracted from the visual input would be available to visual processing only, information extracted from a verbal input would be available only to the language processor, etc.). Note that the within-domain computational fluency does not exclude between-domain computations, assuming that there exists a level of representation where modality specific information is brought in as aggregates of features to the "central core". At that level, the information is recoded into an amodal shape of conceptual structure; it is precisely this amodal shape that makes it accessible to the computations taking place at different cognitive components, enabling also the between-domain communication. For example, the system dealing with meaning cannot make sense either of the speech sounds constituting the word that represents an object, or of the visual attributes of that object unless it establishes relations with their respective representations. In order for them to "talk", these different domains need to recognize the primitives of other components' representations. This is possible only if all the participating components, in addition to contributing information on the object's features that are being processed in their respective specific domains, also make these features transformable into an amodal representation of that object – its concept. In addition to features, concepts are also defined by their unique associations. Furthermore, conceptual structures make up the conceptual knowledge, which is stored in semantic long-term memory that is normally available to the language processor.

Research on naming usually employs tasks such as naming a pictured or visually presented object. Unlike the contexts of everyday speech situations, where speech may or may not refer to the visual scene, the contexts of naming tasks are typically simplified in terms of the nature and number of the presented stimuli. In contrast, observing a visual context of a speech scene in everyday life requires a degree of dynamics and complexity that may not be present in experimental settings. Thus, different types of information and different levels of information processing are involved in naming task paradigms. However, visual processing is rarely assessed in these patients, even though the role of visual processing in interpretative conceptual-semantic processes in naming seems relevant. In addition, the question of multisensory information binding and also that of how the brain combines information from different processing components into a coherent representation (e.g., where in the brain, how, and when it happens?) are far from clear. So, why is then the impact of visual on speech processing neglected?

Seeing is in itself a complex activity, even though for a long time vision was assumed to be a “passive process”. This misconception was mostly due to the brain's great “integrative efficiency” (Moutoussis & Zeki, 1997). Some researchers suggest that there is a perceptual temporal hierarchy in vision (Zeki, 2003). In other words, the brain perceives and processes two separate visual attributes separately, synchronizing the processes according to its own time (Moutoussis & Zeki, 1997). In other words, visual attributes are not processed simultaneously; there exist asynchrony and temporal hierarchy in visual perception. For example, color is perceived before motion by ~ 80 msc, and locations are perceived before colors, which in turn are perceived before orientations (Moutoussis & Zeki, 1997, Zeki, 2003). The asynchrony is caused by differences in processing times for different visual attributes. The integration of separate visual attributes is brought about by the “visual brain using a strategy that is different from what seems the most obvious one – that of integrating the results of its many operations in such a way that what happens in real time is brought into precise temporal registration *perceptually*. Instead, the brain appears to ignore real time and synchronize with respect to its own time” (Moutoussis & Zeki, 1997: 1423).

The facts that binding within visual attributes (color to color; motion to motion) is faster that binding between attributes (color to motion) and that we become conscious first of the *bound attributes* and only after that of the *bound percept* itself (Zeki, 2003: 216) open the following question: Is across-domain binding of attributes possible before the attributes form what will become a “bound percept” in a particular component of cognitive architecture? For example, there is evidence indicating that specific attributes, such as color or motion, are more important in categorization of some objects than others (color in fruits when compared to animals, and motion in animate when compared to inanimate things) (Caramazza & Mahon, 2005). Due to visual perceptual asynchrony and temporal distribution of auditory information, it seems plausible that across-domain (visual vs. auditory) between-attributes binding (color-motion vs. sound-meaning) may affect semantic processes involved in object naming. For example, it is possible that a color, shape, or motion of an object triggers the correct meaning of a word that is associated with the concept of that object without necessarily enabling the word retrieval in the form of a spoken output. Still, without syntactic cueing it would be very difficult to accurately comprehend sentences testing complex structures with reversible Agent vs. Patient thematic roles. Thus, ST recognizes an object as such and action in which it is involved, she recalls the concept associated with that object, but she cannot always retrieve the correct word that represents that concept. What seems to be affecting her naming efforts is lack of temporal unification of all the fine features that characterize a specific concept when similar concepts are simultaneously presented. So instead of retrieving an accurate name, ST makes semantic coordinate errors in speech production (e.g., "lion" instead of "tiger"). However, since the case system in Croatian as in Serbian allows unambiguous marking of subject vs. object function, case marking is used as a reliable strategy to predict thematic roles, thereby enabling accurate sentence comprehension.

This seems to be the realm of interface modules. Recall that according to the representational modularity view, interface modules process information coming from different domains, unifying it into a representation which remains interpretable throughout the next processing step. Among the cortical regions that support this type of information unification, i.e. where "auditory and visual objects may be bound into a unified semantic/ conceptual representation" the most prominent seem to be those around the left inferior frontal sulcus (IFS) and the mid-frontal gyrus (FG) (Adams & Janata, 2002). Furthermore, Homae, Hashimoto, Nakajima, Miyashita, & Sakai (2002) present functional Magnetic Resonance Imaging (fMRI) evidence on a region that supports amodal sentence processing - a ventral region of the inferior frontal gyrus (IFG) supports "the selection and integration of semantic information that are separable from lexico-semantic processing" (p. 883). Thus, different representations that are formed in the course of language processing may be teased apart and their neural underpinnings determined as discrete neural areas. The case of ST shows that the mind has its ways of compensating for missing elements of certain representations via strategies for enabling interaction/ integration of these representations.

Conclusions

In this paper I have addressed the issue of interaction between the conceptual and grammatical knowledge on an example from dissociation of syntax and the lexicon in an anomic patient, ST. I have argued that grammatical cues available to the parser may aid sentence comprehension in some cases when lexical information is lacking (e.g., via case endings indicating grammatical functions, which in turn indicate thematic roles). In other words, evidence from aphasia shows that correct interpretation of a sentence is possible in certain cases even though the mental lexicon is skipped, as illustrated by ST's ability to comprehend syntactically complex sentences in the face of her inability to retreive words (nouns). This processing anomaly was further analyzed in terms of a strategy that distils all the available perceptual information from the speech situation (e.g., visual information on the objects and actions in a visual sciene) to complement parsing. Thus, representational devices that failed to construct lexical representations were still able to provide an adequate interpretation of a sentence, despite the patient's inability to recode particular mental representations into lexical information. In other words, she managed to integrate the conceptual knowledge with available grammatical information as sentences unfolded in real time.

However, ST's syntactic comprehension is atypical, because her syntactic semantics compensates for her lack of expected lexical knowledge (names of animals). When the information conveyed by syntactic semantics is missing and the patient relies exclusively on her lexical knowledge, comprehension fails (as in naming task). This has important implications for the role of grammar in cognition, indicating a more direct relationship between the conceptual structure and the aspects of representation expressed via syntax than previously assumed. Further research is needed to address the question of how exactly syntax employs information from other, non-grammatical components and the possible implications of such findings for treatment of aphasia. An obstacle to overcome here is to reconcile the traditional or structural view of cognition with the growing evidence on more dynamics and variability in it. Thus, the challenge is to find out how perception, which by definition implies dynamics and variability (Smith & Jones, 1993), affects a static system such as our knowledge of grammar, i.e. a set of rules "somehow" instantiated in the brain (Chomsky, 1981) in individual cognitive acts.

Acknowledgments

Thanks are due to the audience of the 4 HOWL workshop held at the Johns Hopkins University, Baltimore, MD, USA, October 12-15, 2007, for their very helpful comments and suggestions on an earlier version of this paper. Some work on the present version of the paper was done in a very stimulating environment of the Center for Language and Cognition at the University of Groningen in spring of 2008.

References

Adams, R. B. & Janata, P. (2002). A Comparison of Neural Circuits Underlying Auditory and Visual Object Categorization. *NeuroImage, 16,* 361-377.

Arevalo, A., Perani, D., Cappa, S. F., Butler, A., Bates, E. & Dronkers, N. (2007). Action and object processing in aphasia: From nouns and verbs to the effect of manipulability. *Brain and Language, 100,* 79-94.

Barry, C. & McHattie, J. V. (1994). Problems Naming Animals: A Category-specific Anomia or a Misnomer? In: Campbell, R. & Martin, A. C. (Eds.). *Broken Memories: Case Studies in Memory Impairment,* (237-248). Oxford, UK: Blackwell Publishers Ltd.

Caramazza, A. & Mahon, B. Z. (2005). The organization of the conceptual knowledge in the brain; The future's past and some future directions. *Cognitive Neuropsychology, 22,* 1 -25.

Chomsky, N. (1981). *Lectures on Government and Binding.* Dordrecht: Foris Publication.

Fadiga, L. & Craighero, L. (2006). Hand actions and speech representation in Broca's area. *Cortex, 42,* 486-490.

Fadiga, L., Destro, M. F., Finos, L, Cotillon-Williams, N., & Smith, A. T. (2006). Language in Shadow. *Social Neuroscience, 1(2),* 77-89.

Fodor, J. A. (1983). *The Modularity of Mind.* Cambridge, MA: MIT Press.

Funnell, E. & Hodges, J. (1996). Derificits of semantic memory and executive control: evidence from differing effects upon naming in dementia. *Aphasiology, 10(7),* 687-709.

Goodglass, H., & Kaplan, E. (1983). *Assessment of aphasia and related disorders* (*2nd ed.*). Philadelphia: Lea and Febiger.

Hillis, A. E. & Caramazza, A. (1995). The Compositionality of Lexical Semantic Representations: Clues from Semantic Errors and Object Naming. *Memory, 3,* 333-358.

Homae, F., Hashimoto, R., Nakajima, K., Miyashita, Y. & Sakai, K. L. (2002). From Perception to Sentence Comprehension: The Convergence of Auditory and Visual Information of Language in the Left Inferior Frontal Cortex. *NeuroImage, 16,* 883-900.

Jackendoff, R. (1997). *The Architecture of the Language Faculty.* Cambridge, MA: The MIT Press.

Jackendoff, R. (2000). Fodorian Modularity and Representational Modularity. In: Grodzinsky, Y., Shapiro, L. & Swinney, D. (Eds.). *Language and the Brain. Representation and Processing,* (4-30). San Diego: Academic Press.

Jackendoff, R. (2002). *Foundations of Language. Brain, meaning, Grammar, Evolution.* Oxford: Oxford University Press.

Kaas, J. H. & Hackett, T. A. 1999. 'What' and 'where' processing in auditory cortex. *Nature Neuroscience, 2(12),* 1045-1047.

Kempe, V. & MacWhinney, B. (1999). Processing of Morphological and Semantic Cues in Russian and German. *Language and Cognitive Processes, 14(2),* 129-171.

Kljajevic, V. (2005). *Comprehension of wh-dependencies in Broca's aphasia.* PhD thesis. Carleton University, Ottawa, Canada.

Knoeferle, P., Crocker, M. W., Scheepers, C., & Pickering, M. J. (2005) The influence of the immediate visual context on incremental thematic role-assignment: Evidence from eye-movements in depicted events. *Cognition, 95(1),* 95-127.

Knoeferle, P. & Crocker, M. W. (2004). When Stored Knowledge Competes with Scene Information in Sentence Comprehension. CUNY 2004.

Mahon, B. Z. & Caramazza, A. (2005). The Orchestration of the Sensory-Motor Systems: Clues from Neuropsychology. *Cognitive Neuropsychology, 22,* 480-494.

Moutoussis, K. & Zeki, S. 1997. Functional Segregation and Temporal Hierarchy of the Visual Perceptual Systems. *Proceedings: The Royal Sociaty London: Biological Sciences, 246 (1387)*, 1407-1414.

Oliver, R. T. & Thompson-Shill, S. L. (2003). Dorsal stream activation during retrieval of object size and shape. *Cognitive, Affective, and Behavioral Neuroscience, 3(4),* 309-322.

Silva-Pereyra, J., Conboy, B. T., Klarman, L. & Kuhl, P. K. (2007). Grammatical Processing without Semantics? An Event-related Brain Potential Study of Preeschoolers using Jabberwocky Sentences. *Journal of Cognitive Neuroscience, 19,* 1050-1065.

Raven, J. C. (1965). *Coloured progressive matrices.* London: H.K. Lewis & Co.

Reed, C. L., Klatzky, R. L., & Halgren, E. (2005). What versus where in touch: An fMRI study. *NeuroImage, 25,* 718-726.

Shapiro, K. & Caramazza, A. (2003). Grammatical processing of nouns and verbs in left inferior cortex? *Neuropsychologia, 41,* 1189-1198.

Smith, L.B. & Jones, S.S. (1993). Response: Cognition without Concepts. *Cognitive Development, 8,* 181-188.

Strelnikov, K. N., Vorobyev, V.A., Chernigovskaya, T.V. & Medvedev, S.V. (2006). Prosodic clues to syntactic processing—a PET and ERP study. *NeuroImage, 29* (1127-1134).

Tanenhaus, M.K., Spivey-Knowlton, M.J., Eberhard, K.M. & Sedivy, J.C.(1995). Integration of visual and linguistic information in spoken language comprehension. *Science, 268 (5217)*, 1632-4.

Warrington, E. K. & Schallice, T. (1984). Category specific semantic impairments. *Brain, 107,* 829-854.

Wechsler, D. (1981). *Wechsler adult intelligence scale—Revised.* Cleveland, Ohio: The Psychological Corp.

Zeki, S. (2003) The disunity of consciousness. *Trends in Cognitive Sciences, 7 (5),* 214-218.

Vanja Kljajević

PRESKAKANJE REČNIKA? OD SINTAKSE DO POJMOVNOG ZNANJA

Apstrakt

Ovaj članak istražuje kognitivne osnove jedne strategije rečeničnog razumevanja kod ST, pacijentkinje sa anomijom. Iako je njeno razumevanje složenih sintaksičkih struktura kao što su relativne rečenice, pasivne konstrukcije i 'wh'-konstrukcije na najvišem nivou, ona često ne može da tačno imenuje ili pokaže predmete na koje referiraju imenice korištene u tim strukturama. Disocijacija sintakse i leksikona kod ST ukazuje na mogućnost postojanja mehanizma koji povezuje sintaksu i konceptualno znanje, i koji funkcioniše i kada ST ne uspeva da koncepte 'prevede' u reči. Jedna od hipoteza koje se razmatraju u ovom članku je da je strategija razmevanja kod ST zasnovana na sintaksičkom cueing-u koji omogućavaju gramatičke funkcije imenica čak i kada ST ima problema sa značenjem tih imenica. Druga hipoteza je da ST kombinuje raspoložive lingvističke informacije sa percepcijom vizuelne scene rečenice u enaktment zadatku, što joj uzeto zajedno osigurava pristup konceptualnim informacijama dok se sam leksion preskače.

Ključne reči: *anomija, pojmovno znanje, reprezentaciona modularnost, interfejsni moduli.*