(Light) Verb Retrieval in a Case of Primary Progressive Aphasia

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Abstract

In this work we present a study of verb syntax in a case of Primary Progressive Aphasia, trying to empirically check two radical claims about Lexicon and syntax: a) verbs are a closed class of *light verbs* (Kayne, 2009); b) argument structure is a matter of syntactically driven operations (incorporation / conflation), in a constructionalist fashion (Hale and Keyser, 1993, 2002).

1 Introduction

In this paper, we present a case of Primary Progressive Aphasia (PPA), which seems to support the idea of verbs as a "closed class" recently proposed by Kayne (2009) - drawing inspiration from Hale and Keyser (1993; 2002) - in a paper in which he addresses many questions concerning antisymmetry and the Lexicon. PPA is a degenerative syndrome marked by progressive deterioration of language functions and relative preservation of other cognitive domain[1], firstly investigated by Mesulam (1982). On the basis of the nature of language impairment, patients with PPA have been subdivided into semantic, agrammatic/dysfluent and logopenic subtypes (Mesulam *et al.*, 2009). Following this classification, the semantic variant is characterized by poor single word comprehension but relatively well-preserved fluency and syntax; the agrammatic variant by poor syntax and fluency but relatively preserved word comprehension; and the logopenic subtype by preserved syntax and comprehension but variable fluency.

2 Aim of the work

In order to empirically investigate Kayne's (2009) claim about a Lexicon in which only nouns can be considered as primitives and to test the proposal of an argumental structure without thematic roles as primitives, which derives thematic interpretation from syntactic position (*akin to* Hale & Keyser 1993, 2002), we ideally need the "mirror image" of an agrammatic speaker[2], namely a subject who has well-preserved functional morphology and, on the other hand, a deep anomia, affecting her lexicon. In other words, we need a subject that could trigger a sort of "transparency effect" in order to provide evidence that the noun *vs.* verb processing dissociation in aphasia[3] (an inflated topic in the literature) can be addressed, starting from the hypothesis that nouns are primitives, while verbs are a "syntactic product[4]", derived by incorporation of nouns into

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[1] Functional neuro-imaging studies on PPA have shown abnormalities mostly in the left anterior and posterior temporal lobe, with reduced language-related activations in Broca's and Wemicke's areas, and increased activations of the left posterior frontal cortex and right hemispheric regions (cf. Sonty *et. al.*, 2001).

[2] One of the hallmarks of agrammatic-type Broca's aphasia is a deficit in the production of functional morphology. Both free-standing function words and bound morphemes used to mark grammatical functions are impaired in this population, crosslinguistically (see Avrutin, 2000 and references cited there; see also the groundbreaking works of Berndt and Caramazza, 1978 and Goodglass, 1976).

[3] Several researchers have shown that verb production is more impaired than noun production in individuals with agrammatic aphasia (see Luzzatti and Chierchia, 2002 and references cited there; also see Miceli *et al.* 1989).

[4] Another possibility, pursued in the Distributed Morphology (DM) framework (Halle and Marantz, 1993) is to assume an "Underspecification" of lexical items, which basically prevents items of the Lexicon from needing to be fully specified relative to their contexts of occurrence. From a psycholinguistic viewpoint, Barner and Bale (2002), adopting DM paradigm, argue that a theory without prefixed lexical categories can provide a better account of creative language use and category-specific neurological defi-

verb positions[5]. An approximation of this ideal subject has been found in a patient affected by non-fluent PPA. Her grammatical features (e.g. tense and agreement markers) are well preserved, so that her language production appears to be almost exclusively damaged by severe anomia.

A preliminary probe to check if we are on the right track should come from raw hints in previous researches within the neurolinguistic literature. Our idea, in fact, leads to the following approximate consequence: agrammatic Broca's aphasics should be impaired on semantically light (functional) verbs, while pathologies which have anomia as one of their most salient feature (say, for example, Alzheimer disease) should lead to transparency effects in the Lexicon, relying on an increased rate of complex predicate/light verb constructions.

For Broca's agrammatism, for instance, a recent study by Barde *et al.* (2006) has detected greater difficulty producing verbs that have fewer semantic components (namely, *light verbs*) compared to verbs that have greater semantic weight; conversely, the "semantic complexity" of verbs seems to affect Alzheimer disease, but not agrammatic patients' performance (Kim and Thompson, 2004). Hence, these data seem to support our hypothesis of selective differential impairments within the verbal category.

Shifting on a "*bioprogrammatic* perspective", which basically follows Bickerton (1984, and subsequent related works), our data should find endorsements in the field of *language acquisition* and *language creation*, labeling under the language creation process, the formation of *pidgins & creoles* (see DeGraff, 1999). Leaving aside the debate on Creole genesis (cf. Lefevbre, 1998) the interesting fact here is that creoles heavily rely on light verb constructions. A paradigmatic example is Sranan, a creole language spoken as a *lingua franca* by approximately 300,000 people in Suriname (see Essegbey, 2004), which makes extensive usage of serial light verb constructions (cf. on serial verbs Baker, 1989; Carsten, 2002; Collins, 1997, 2002; Aboh, 2009). Other examples, just to name a few include Saramaccan, a creole spoken by about 24.000 people near the Saramacca and upper Suriname Rivers in Suriname (Veenstra, 1996; cf. also Aboh, 2005), and many other Caribbean creoles (e.g Leeward

creole of Antigua and Barbuda, Jamaican creole, etc., see Durrleman-Tame, 2008).

Other *hints* come from language acquisition. During the past few years, language acquisition researches have reported learners' use of semantically empty, "dummy" verbs (e.g. for English, Dutch, German, etc.), such as the verb form 'is' in the Dutch (ungrammatical) example "Hij is doorrijden" (*He is drive*) or the ungrammatical sentence with "do" "ik doe ook praten" (*I do also talk*). These constructions resemble English *do-support* constructions where '*do*' lacks a specific meaning (Evers and Van Kampen, 2001; Van Kampen, 1997; Radford, 1990; Roeper, 1992; Zuckerman, 2001; see also Bottari *et al.* 1993; Lightfoot, 1999).

Other possible suggestions can come from *language contact*. For instance, interesting evidence comes from loan words in a typological perspective. Recent investigations have found out that cross-linguistically a (wide-spread) strategy to absorb loan words into a "native" Lexicon is a special derivation process involving a light verb to accommodate the item that has been borrowed (see, for example, Wichmann and Wohlgemuth, 2008).

Independently from the perspective that can be adopted to explain the light verb spreading in the contexts of language acquisition, language creation and language contact (parameter setting, underspecification, pragmatically based accounts, etc.), the facts outlined above let us think that the "light verb" issue is a matter worth being investigated within neurolinguistics, with special regard to language pathology.

2.1 Case Study

Our patient (BB) is a 59 right-handed Italian woman with 17 years of scholarity, tested for three months (April-July 2009), 2.3 years after the onset. Standard tests (B.A.D.A., AAT) showed no differences in her production of nouns vs. verbs, both highly impaired. Previous works on PPA reported greater impairment in the naming of verbs than nouns (Hillis *et al.* 2006). Another study, however, found no evidence of reduced verb production (Graham *et al.* 2004). It was noticed that PPA patients use a verbal vocabulary that is somewhat less specific than normal speakers, with a larger use of so called "light verbs" (Graham and Rochon, 2007).

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cits, while also offering a natural solution to the "bootstrapping" problem in language acquisition.

[5] Hale and Keyser (1993) claim that lexical verbs derive from a syntactic operation of incorporation/conflation of nouns into verbal slots.

3   Ligh verbs and the "verb as a closed class hypothesis" in a typological perspective

While in many languages it has been observed that, for instance adjectives or adverbs can constitute a closed, often quite small class[6] of elements (Dixon, 2004), the claim that verbs can be a closed class may appear controversial. But, as observed in Cinque and Rizzi (2010: 58): "If Hale and Keyser's (1993) idea that most transitive and intransitive verbs are not primitive but result from the incorporation of a noun into a limited class of light/general purpose verbs ('do', 'give', 'take', 'put', 'hit', etc.), then even the class of primitive verbs may turn out to be closed and relatively small. This seems confirmed by the fact that some languages typically fail to incorporate the noun into the light verb so that most 'verbal meanings' are expressed as V+N periphrases".

In order to find out a possible definition, in the framework of LFG, Alsina, Bresnan and Sells (1997: 1) summarize these V+N "complex predicates" as: "predicates which are multi-headed; they are composed of more than one grammatical element (either morphemes or words), each of which contributes part of the information ordinarily associated with a head". Examples of languages in which verbs seem to be a closed (functional) class include Iranian languages, such as Persian and Kurdish, which rely almost exclusively on functional verb constructions. It has been argued that (simple) verbs in these languages form a closed class and most light verb/complex predicate constructions[7] do not have simple verb counterparts (Megerdoomian, 2002). A somewhat different instance of light verb construction is found in a number of Northern Australian languages[8]. Other examples of languages that adopt a "functional verbs" strategy are Urdu, Hindi (Butt, 1995), Amharic (Amberber, 2010) and some South-American languages (e.g. Mosetén (Sakel, 2007)). Given this theoretical and typological introduction, we can illustrate what we have found in our PPA

patient.

4   Methods and materials

We collected five samples of BB spontaneous speech from March to July 2009 (1251 words altogether). The samples were recorded in a quiet room at San Camillo Hospital, Venice, at the presence of two examiners that BB knew very well. During BB speech production the examiners never interrupted her, excepting for some few words to encourage her when she seemed to be tired or frustrated.

Two people separately transcribed the recordings. The two transcriptions were compared, and the few controversial passages were listened by a third person who didn't know the previous results. Only if the third transcription tied in one of the two previous ones, so the passage was included in the transcription.

Four control subjects, two men and two women, have been involved in the experiment. They matched with the subject by age and years of instruction and they didn't have any physical, neurological or psychological problem.

We collected five samples of spontaneous speech from the control subjects too, and then we cut the samples in order to obtain approximately the same number produced by the patient. We faithfully transcribed the samples following the same method we had used for the patient.

All verbs occurrences were counted. By "occurrence" we mean every time a verb was necessary to avoid an ungrammatical sentence. In this way, also omissions were included in the number of occurrences. The repetition of a word was considered a single occurrence if it was used to express a single concept.

Then the number of verbs really produced by the subject was considered, and a percentage was obtained in relation with the number of words.

Finally, verbs were divided into three classes: lexical verbs, functional verbs and quasi functional verbs (for the hypothesis of the existence and relevance of quasi functional / semi-lexical categories refer to the works collected in Van Riemsdijk and Corver 2001). Following Cinque (2006) and Cardinaletti and Shlonsky (2004), we considered as functional verbs not only auxiliaries, but also volitional, modal and causative verbs and the light verb "fare". In particular, we separately counted the occurrences of the functional verb "fare" + NP, because BB quite systematically substituted unergative and transitive verbs by this "semantically lighter" construction.

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[6] This fact is evident in those languages – such as, for example Yoruba (see Dixon, 2004; Cinque 2006) - in which adjectives cannot be used predicatively: the attributive only adjectives form a closed (functional) class of elements.

[7] Folli *et al.* (2005) have showed that Persian can be considered as a transparent instance of Hale & Keyser's "constructionalist" model.

[8] In these languages, the host element is not a nominal, but comes from an open class of "underived predicative elements", termed *coverbs* (Pawley, 2006).

Percentages of every verbal class were obtained in relation to the total number of verb produced by the subject.

Omissions were lso classified; we separately counted omissions of the entire VP (calculated on the number of occurrences), omissions of the functional verb, and omissions of the lexical part of a "compound" form (the last two were considered in relation to the number of verbs produced).

We also considered the type/token ratio relatively to lexical verbs, in order to establish whether BB's lexicon was poorer than which of the controls.

5 Results

Interestingly, the progressive erosion of the lexicon in this case of PPA left almost intact the functional domain above VP, assuming a "cartographic" architecture of this kind ([FPz [FPy [FPx [VP]]]]) (Cinque, 2006; Cardinaletti and Shlonsky, 2004).

If we compare BB to the control group, BB produced a satisfactory number of verbs in relation to her words production Nevertheless some crucial differences could be detected, compared to the control subjects, considering the classes of verb she used most often.

Firstly, BB deep anomia was confirmed by the low percentage of lexical verbs she produced in relation to the total number of verbs (12,7% vs 42,1% of the controls).

Moreover, the lexical part of "compound" forms in which the functional verb was preserved, was omitted in the 13,2% of cases. The control group omitted it only in the 0,7% of the times.

The patient however had no hesitation with volitional, modal, and causative verbs which we assume to be hosted in functional projections above VP[9], and which are the 40,2% of her verb production. Only 1,6% of errors/omissions, affecting this verbal class, has been detected in obligatory contexts.

A second challenging result is that unergative and transitive verbs (such as *spiegare*, to explain) have been quite systematically substituted, in their "heavy form", by a light-verb+N form (e.g. *fare una spiegazione*, to do an explanation).

BB used the construction FARE+NP in the 14,8% of times (including the contexts in which BB was unable to retrieve (omitted) the *paired* N; 6,4%). Control subjects hardly ever omitted the nominal part (we found only one case in the entire corpus) and used this construction the 5,4% of the times on the average.

A third striking fact is that unaccusative verbs are preserved (17,5% of correct distribution/retrieval), confirming previous neurolinguistic observations (Froud, 2006), about their (quasi)functional status (see also Cardinaletti and Giusti (2003); Zubizzareta and Oh (2007)).

Interestingly the control group produced the 13,4% of unaccusatives verbs on the average, showing that, not only BB has not difficulties in retrieving this kind of verbs, but also that she prefers to use them, instead of looking for a more specific one.

Hence, from a quantitative viewpoint a different ratio of performance between functional verbs (preserved) and lexical verbs (impaired) in a patient of PPA has been detected. Data from previous works (Kim and Thompson, 2004; Barde *et al.* 2006) seem to predict that similar investigations on broader populations of "purely" anomic patients may confirm our results. From a theoretical viewpoint, we can suggest that, if anomia (the salient feature of this case of PPA) affects lexical classes, and according to Kayne (2009), the only open (lexical) class is represented by nouns, the fact that anomia selectively spares functional (light) verbs and leads to the surface's retrieval of Hale and Keyser's L-syntax could be considered a neurolinguistical evidence that the noun-verb distinction may be understood as a consequence of antisymmetry[10]: verbs may be seen as a closed class (all functional, all light). The immediate retrieval of a light verb (e.g. *fare*: to do) is forced by anomia: BB uses the otherwise silent light verb to which nouns incorporate/conflate (e.g. adjoining to the light-verb or moving to a Spec-position related to the light-verb). Notice that the lexical items (nouns), as we have already seen above, don't easily resurface in BB speech (poor inventory, pauses, neologisms).

We will try to support this theoretically driven claim with further (and broader) experimental evidence, trying also to elaborate a model (roughly based on CoLFIS (*Corpus e Lessico di Frequenza dell'Italiano Scritto,* see Bertinetto *et al.* 2005) to account for possible frequency effects.

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[9] No data concerning aspectual verbs emerged from BB spontaneous speech.

[10] In recent updates of his work, Kayne (2009) attributes different (opposed) configurational properties to nouns and verbs.

6 Conclusion

In this paper we have tried to empirically verify two radical claims about Lexicon & syntax: i) real verbs are only grammatical ones (Kayne, 2009); ii) argument structure is a matter of syntactically driven operations, in a constructionalist fashion (Hale and Keyser, 1993, 2002). We have find out that these interrelated hypotheses can be tested and successfully verified within clinical linguistics, more specifically working with anomic patients, whose syntax is not (heavily) impaired.

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