Categorie grammaticali e classi di parole. Statuto e riflessi metalinguistici

a cura di Francesco Dedè

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Domenica Romagno

On word class-specification: evidence from linguistics and cognitive neuroscience*

1. Introduction

The present paper focuses on certain critical aspects of the long-debated issue of word classes[1]. In particular, we address two main questions: 1) is word class-specification necessarily incorporated into lexical items? 2) does the organization of word knowledge in the brain rely on word class-specific information?[2]

To answer these questions, we present data from complementary fields, thus showing how the combination of historical and typological linguistics with cognitive neuroscience makes specific contributions to developing a consistent account of word class processing.

2. Is word class-specification necessarily incorporated into lexical items?

In the following examples from Old Indian, lexical roots may behave as either noun or verb and, therefore, take either nominal or verbal endings, on the basis of the function they carry out in the sentence:

(1.a) *sū-* "mother" = noun
RV, I, 32, 9 *úttarā <u>sūr</u> ádharaḥ putráḥ* (*sū-r* = sg. nom. < *sū-s*[3])
"the <u>mother</u> was above; the son below" (Jamison & Brereton 2014)

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[1] For a brief history of research on word classes and for terminological issues, see Bossong 1992, Haspelmath 2012a, Simone & Masini 2014, Panagiotidis 2015, among others.

[2] For a proposal of a more comprehensive account of the categorization principles underlying word classes and a general discussion on the universality of grammatical categories, see Romagno 2016 (in press_a).

[3] After vowels different from *ă*, final *-s* > *-r* when the following word starts with a vowel or a sounded consonant.

(1.b) *sū-* "to give birth to" = verb
RV, I, 164, 17 *kvà svit sūte nahí yūthé antáḥ* (*sū-te* = middle pres. ind. 3 sg.)
"where does she give birth, for it is not within the fold? (Jamison & Brereton 2014).

(2.a) *trā-* "protector" = noun
RV, I, 100, 7 *táṁ kṣémasya kṣitáyaḥ kṛṇvata trā́m* (*trā́-m* = acc. sg. masc.),
"him do the settled peoples make the protector of their peace" (Jamison & Brereton 2014)

(2.b) *trā-* "to protect" = verb
RV, VIII, 61, 17 *adyādyā śváḥ-śva Indra trā́sva paré ca naḥ* (*trā́-sva* = middle pres. impv. 2sg.)
"today after today, tomorrow after tomorrow, rescue us o Indra" (Jamison & Brereton 2014)

This list could be easily increased: *dā-* "to give" (see *da-dā-ti* = reduplicated present indicative, *(a)-dā-t* = aorist indicative, cf. Latin *dare*) or "giver" (RV, VI, 16, 26), *spaś-* "observer" or "to observe, to see" (cf. Latin *haru-spex*; RV,VIII,61,15 vs. RV,I,10,2), ad so on.

In these pairs of radical formations[4], lexical roots are underspecified for word class and the distinction between noun and verb is exclusively based on the concurrent opposition between verbal and nominal endings: «il verbo e il nome non esistono anteriormente all'uso delle desinenze verbali e nominali, né quest'ultime possono precedere quelle verbali dato che non si individuano senza opporsi» (Belardi 1950: 102; see also Meillet 1934).

The same principle that is manifested in the distinction between nominal vs. verbal radical formations of Old Indian underlies a more general mechanism of word «generation», which characterizes the reconstructed Indo-European, as demonstrated by Belardi 1990:158ff. This mechanism entails a dynamic structure of words, which comprises different modules: the lexical root – *dhātu-* "fundamental constituent, primary block [of words]", as defined by Old Indian grammarians – can combine with other constituents that serve grammatical processing, such as affixes

[4] It is worth remarking that radical formations with nominal function often coexist with suffixed allomorphs (that is, formations with additional noun function-indicating coding), which represent a higher productive class: e.g., *trā́tṛ- / trātṛ́-* "protector", *dvéṣas-* "hate, hostility", *dātṛ́-* "giver", etc. For a comparison with other ancient Indo-European languages, in historical perspective, see the detailed discussion on radical nouns in Homeric Greek by DEDÈ 2010.

and inflectional markers, that encode a large variety of accessory but equally necessary notions (like mood, aspect, actionality, comparison, the property of being an action, agent or instrument noun, etc.) and morphosyntactic information, including word class-specification. In this system, all modules are available to speakers, who are, then, able to combine them in different ways – obviously, by following the functional rules proper to the target language – in order to produce the required expressions.[5]

Therefore, lexical roots are not preclassified for morphosyntactic features, including word class. A modular lexicon, indeed, is formed and defined on the basis of the target context: «la massa delle parole che dobbiamo immaginare possibili nella preistoria indoeuropea prossima doveva essere di tipo modulare [...], e in larga parte autoschediasmatico, cioè improvvisato secondo la necessità del momento» (Belardi 1990: 175).

The mechanisms of word generation and grammatical processing especially manifested in ancient Greek and Sanskrit, among the older well-attested Indo-European languages, show that lexical items are precategorial[6], in the sense that morphosyntactic information is not necessarily incorporated into lexemes, but, rather, word class distinction critically operates in the actualization of grammar, where word class-specific information is crucial to grammatical (e.g., morphosyntactic) processing.

The principle that is implemented at the word level in languages like ancient Greek and Sanskrit applies to the clause level in languages with lower or zero degree of word modularity, such as modern English (e.g., *I judge* = verb vs. *the judge* = noun), where the dynamicity of word internal

[5] In a more general view, we would like to remark a significant parallelism between affixes and inflectional markers: the relationship between lexical roots and affixes follows a rule such as if the root is in the full grade, the suffix is in the zero grade, whereas if the root is in the zero grade, the suffix is in the full grade (e.g., Greek ἔργον < *ϝερ-γ : ῥέζω < ϝρ-εγ: Benveniste 1935, Hirt 1990; the same rule governs the relationship between lexical roots and inflectional markers in cases of paradigmatic ablaut: e.g., Sanskrit *asti* (<**est(i)*), but *smas* (< **s-me/os*). Converging evidence is that middle presents that have the root in the zero grade take inflectional markers in the full grade. On the ablaut (e.g., Skr. *dviṣáḥ, dviṣám – dvéṣṭi*; Greek στίχες, στοῖχος – στείχω), see Belardi 1990:187ff.: «anche i singoli moduli componenziali della parola indoeuropea preistorica e spesso storica non sono fissi, non sono monoblocco: nella sequenza fonologica 'costante' si inseriscono procedimenti formali morfologici [e.g., ablaut, infixation] a renderla funzionalmente mobile e discontinua» (p. 189).

[6] On the relationship between precategoriality and word flexibility and on different degrees of «specialization» in the expression of the word class distinction across languages, see Hengeveld 1992, Rijkhoff & Van Lier 2013, and the target article on word classes in Mundari (a Munda language spoken in India) by Evans & Osada 2005. On the high degree of word flexibility in Mundari, see Hoffmann's seminal work (Hoffmann 1903).

structure, originally related to functional variability, is significantly reduced, relative to older stages[7]. Also languages different from Indo-European, such as Semitic languages, show the same mechanisms of word production and comprehension. Their sign, in fact, is dynamic and modular: it comprises different constituents, that encode either lexical or grammatical information and are combined according to the target context; the difference is that in Indo-European languages modules are combined linearly, whereas Semitic languages manifest nonconcatenative morphology[8].

In all the above-mentioned cases, word class-specification is not incorporated into lexical items, but the distinction between nouns and verbs occurs in the actualization of grammar, where word class-specific information is crucial to produce and comprehend words in their appropriate context.[9]

Converging evidence comes from typologically different languages, such as Chinese. Bisang 2008a showed that in Late Archaic Chinese lexical items are precategorial, i.e., they are not preclassified in the lexicon for the syntactic functions of noun and verb. Nonetheless, the noun/verb distinction at the level of syntax is crucial to analyze utterances in Late Archaic Chinese.[10]

[7] Indo-European languages progressively replaced the internally articulated sign with a fixed sign. On the change of word typology in Indo-European languages, in relation to a more general discussion of crucial dimensions involved in Indo-European reconstruction, see BELARDI 1990:158ff.

[8] On the relationship between word modularity and ablaut, also in non-Semitic languages (e.g., Greek στίχες, στοῖχος – στείχω, ἔλειπον – ἔλιπον, etc.), see n.5. Significantly, word class distinction exploits the dynamicity of Semitic word structure: different combinations, indeed, encodes a large variety of noun/verb types, thus paralleling a verb>noun lexical cycle, in Simone's term (SIMONE 2003), that involves different dimensions. On the multifactorial and greaded nature of word classes see below, in the main text (§ 3).

[9] Significantly, this has a parallel in cognitive processes beyond language: for instance, the ability of humans to recognize object categories is better and faster when the context is provided, despite variability in pose, changes in illumination and occlusions (OLIVA & TORRALBA 2007).

[10] The context appropriate to word class processing, in fact, may be barely syntactic, morphological, morphosyntactic (e.g., *I judge* = verb vs. *the judge* = noun; Italian *io cammino* "I walk", present indicative of *camminare* "to walk" vs. *il cammino* "the path", *la camminata* "the walk"; *il/la giovane sorrise* "the young man/woman smiled", where *giovane* "young" functions as a noun vs. *il giovane studioso* "the young researcher", where it functions as an adjective), pragmatic (e.g., in Tobelo, a Papuan language spoken in eastern Indonesia, property words behave as verbs only when the noun they modify conveys old information; if it conveys new information, they follow the nominal pattern: HOLTON 1999) or differently established in relation to language type. A Chinese monosyllable, for

The precategoriality of lexical items grounded in diachronic evidence and typological observations is consistent with models of word generation and, on the whole, of grammatical processing, developed through different research methods. Indeed, it parallels the notion of «lexical underspecification» that plays a pivotal role in the Distributed Morphology (DM) model, based on the achievements of generative linguistics, neurolinguistics and developmental psychology (Marantz 1984, 1997; Halle & Marantz 1994, Barner & Bale 2002). In DM model, lexical roots are underspecified for word class, and the appropriate word forms are generated in the morphosyntactic context by mechanisms similar to those that build phrases. Like the dynamic modularity of ancient Indo-European words, «noun and verb forms are created by insertion of roots into syntax with appropriate functional morphemes» (Barner & Bale 2002: 781). Word structure is not predetermined, as it relies on the target context, «perché deve rispondere alle istanze dell'esprimersi», in Belardi's terms (Belardi 1990: 181).[11]

Precategoriality or lexical underspecification, then, represents a common theme connecting theoretical frameworks and methodologies traditionally considered incompatible or, at least, significantly dissimilar. In fact, the idea that word class-specification is not incorporated into lexical items, but these take their (morpho)-syntactic function on the basis of nominal vs. verbal «functional head», that is syntactic context, in DM's terms, is not incompatible with radically functionalist approaches, such as the constructionist approaches, mostly based on typological investigations and focusing on the non-separation of the formal and the functional dimensions of language, specifically, on the map-

instance, can be classified as belonging to different word classes, thus performing different functions, depending on the syntactic and pragmatic contexts: *xìn*, for instance, can be interpreted as a noun ("confidence, trustworthiness"), a one-argument verb ("to be trustworthy"), a two-argument verb ("to believe, to consider someone as trustworthy") or an adverb ("certainly") (BISANG 2008b). On different origins for polyfunctionality and on transcategorization phenomena, see JEZEK & RAMAT 2009, RAMAT 2005: 89ff. On the so-called 'lexical cycles' and, in particular, on processes of derivation of nouns from verbs and on different types of nouns, see SIMONE 2000, 2003. The idea that the categorization principle manifested in the word class distinction critically operates in the actualization of grammar, where word class-specific information is crucial to produce and comprehend words in their appropriate context, may apply also to cases like Mundari (an Austroasiatic language of India, belonging to the Munda family, as mentioned in note 6, where a stem occur now as one part of speech, now another, according to the context: EVANS & OSADA 2005, COOK 1965 [2007]) and, therefore, account for the «myth of a language without word classes», to quote the fascinating title of the seminal paper by EVANS & OSADA 2005.

[11] For a lively discussion on DM lexical underspecification from different perspectives, see BARNER & BALE 2002, 2005 and PANAGIOTIDIS 2005.

ping relationship between semantics and morphosyntax (Croft 2001, Goldberg 1995, 2005, Trousdale & Hoffmann 2013). In Croft's Radical Construction Grammar, the nominal vs. verbal function of a lexical item is defined by its position («slot») within a construction, that is by the structural environment in which it occurs (Croft 2001): «lexical items are not determined in the lexicon with regard to the occurrence within a particular slot of a word class-indicating construction» (Bisang 2008b: 58).

Converging evidence on categorial underspecification in the lexicon comes from cognitive neuropsychological studies on word class processing. Patients who have no difficulty in accessing lexical roots, may show a breakdown at the grammatical category level, with selective impairment in processing either nouns or verbs in their appropriate morphosyntactic context: when asked to complete sentences including noun and verb homophones like *"these people judge, this person . . ."* – *"this is a judge, these are . . ."*, patient RC, for instance, was able to produce *judges* only in the nominal context, while patient JR only in the verbal context (Shapiro & Caramazza 2003a, Shapiro et al. 2000). On the other hand, a recent study on language processing in semantic dementia shows that patients may retain word class-specific morphosyntactic information despite loss of semantic knowledge of the target words and deficits in lexical retrieval (Romagno 2012b, 2012a: 139-140). Word class dissociations restricted to one modality of output (speech vs. writing) have also been reported (Caramazza & Hillis 1991, Hillis et al. 2003, Rapp & Caramazza 2002): that either noun or verb processing is spared in one modality rules out a damage in accessing lexical roots themeselves, as this would predict deficits in both modalities. Moreover, it is commonly observed that patients who show particular difficulty with verb morphology are, instead, able to produce the target bare root (e.g., the English bare infinitive form).

In conclusion, the noun/verb dissociations reported in cognitive neuropsychological studies reveal deficits in mapping a lexical root onto its appropriate context (nominal vs. verbal) and support the idea that morphosyntactic information, including word class-specification, is not incorporated into lexical roots and, therefore, is not necessarily stored and accessed along with them. This is consistent with the more general observation that deficits involving one dimension of language (e.g., semantics) are not necessarily accompained by deficits involving a different dimension (e.g., morphosyntax): the neural circuits subserving conceptual-semantic processing appear to be distinct from those subserving the morphosyntactic behavior of words (Schwartz et a. 1979,

Breedin & Saffran 1999, Cotelli et al. 2007, Biran & Friedmann 2012, Caramazza 1997, Romagno 2012b).[12]

3. Does the organization of word knowledge in the brain rely on word class-specific information?

Selective deficits in word class processing raise the question of whether word class-specific information is an organizing principle of word knowledge in the brain: noun/verb dissociations, in fact, involve homophones, both words and pseudowords, and appear also when semantic and sensori-motor variables are controlled for.[13]

Several neuroimaging studies addressed this question by investigating word class processing in healthy population, across different lan-

[12] The arguments that we have proposed so far offer a good opportunity to assess competing models of lexical access and grammatical category processing (in particular, Levelt 1992, Levelt et al. 1999 vs. Caramazza 1997), by combining different research methods and perspectives. Altogether, the data discussed in the present paper support a model in which distinct neurocognitive circuits subserve grammatical (e.g., morphosyntactic) processing separately from conceptual-semantic representations and, therefore, the access to lexical items is distinguishable from the access to the rules underlying the morphosyntactic behavior of those items (Caramazza 1997), in contrast with a model in which grammatical categories, including word class-specification, are incorporated into the so-called «lemma node» – a modality-neutral level of lexical representation, intermediate between conceptual-semantic representations and modality-specific outputs – and, therefore, necessarily stored and access together with the lexical root (Levelt 1992, Levelt Et Al. 1999; See Also Rosen 1984, Perlmutter & Rosen 1984). We wish to remark that the model entailing separate circuits for morphosyntax and semantics needs to be completed by adding a further distinction between morphosyntactically relevant and non-morphosyntactically relevant components of word meaning and between semantically determined and non-semantically determined morphosyntactic features (Valin & Lapolla 1997, Levin & Rappaport Hovav 1995, Tenny 1994). The processing of words in forms appropriate to their morphosyntactic context, in fact, may be constrained by what we call interface semantics, i.e., semantic properties that crucially operate at the interface between concepts and grammar, separately from any other kinds of semantic representation (e.g., telicity, agentivity, individuation, etc.: Romagno 2002, 2005, 2006, 2007; Sorace 2000, Alexiadou et al. 2004; Aikhenvald et al. 2001, Chierchia 2010, Rothstein 2010, among others). The distinction between different kinds of both semantic and morphosyntactic information and the specific role of interface semantics in the complex mapping relationship between conceptual representations and linguistic structures are crucial to understanding not only the structural organization and change of language systems, but also the neurocognitive basis of language (Romagno 2012a, 2012b, 2016 [in press_b]).

[13] To mention only a few representative studies from the cognitive neuropsychological literature on double noun/verb dissociation, see Goodglass et al. 1966, Miceli et al. 1984, Maccarthy & Warrington 1985, Caramazza & Hillis 1991, Shapiro et al. 2000, Shapiro & Caramazza 2003a, Laiacona et al. 2003, Laiacona & Caramazza 2004.

guages (e.g., Italian, English, Spanish, Chinese, Persian: Shapiro et al. 2006, Bedny et al. 2008, Willms et al. 2011, Peelen et al. 2012, Tyler et al. 2008, Romagno et al. 2012, Yu et al. 2013, Momenian et al. 2016, to mention only a few representative studies). But, although brain areas have been found to be selectively engaged in processing verbs as compared to nouns, the neuroanatomical findings on the noun/verb distinction remain controversial, and the most robust and constistent result across studies on healthy population, that is, a selective association of the left lateral temporal cortex, including the posterior middle temporal gyrus, with verbs relative to nouns, only partially matches the results of lesion studies. Moreover, whether the neural underpinning of word class distinction relies on formal (specifically, morphosyntactic) or functional (specifically, semantic) grounds is debated (Crepaldi et al. 2013, 2011, Vigliocco et al. 2011, Shapiro & Caramazza 2003b, Shapiro et al. 2006, Tyler et al. 2008, Kable et al. 2005, Peelen et al. 2012).

But, what kind of information is processed when word class-specification is implemented? In particular, which levels of representation are determinant of the differential processing of word classes, as manifested behaviorally and captured neuroanatomically?

We propose that 1) an organizing principle of word knowledge in the brain is manifested at a superordinate level of categorization, above the cluster of features defining word classes, and critically operates in the actualization of grammar, where word class-specific information is crucial to produce and comprehend words in their appropriate context; 2) the multifactorial and graded nature of word classes has a crucial role in their neurocognitive representation and accounts for the heterogeneous patterns of neural activation reported in previous studies.[14]

In a very recent experiment (Romagno et al., in preparation), using advanced functional magnetic resonance imaging (fMRI) techniques, we assessed the neural underpinning of nouns, verbs and (for the first time)

[14] The heterogeneity in neuroanatomical findings on the noun/verb processing may be related to differences in tasks and/or stimuli across studies (Crepaldi et al. 2011, 2013) and, to a certain extent, to the possibly insufficient spatial resolution of fMRI techniques, as revealed by partial mismatches between fMRI data on healthy population and the electrical stimulation mapping data showing that in patients with double-dissociations the verb and noun-specific points in the brain were in a distance of 1 cm or less (Corina et al. 2005, Havas et al. 2015). But these plausible concurrent factors are not sufficient to explain the pattern of neural activation associated with word classes, on the whole; in particular, they do not account for the fact that neural circuits subserving word class processing – as we will show below, in the main text – do not appear just randomly interleaved but, rather, it is possible to identify certain distributional principles related to the differential feature sharing among category members.

adjectives[15], and showed that word class-specific information, indeed, has a significant impact on word representation in the brain, independently of a series of formal and functional competing features, such as form and cumulative frequency, word length, number of core arguments, dynamicity vs. stativity, imageability, concreteness and familiarity, and even when any difficulty confound in performing the linguistic task is excluded. Moreover, importantly, we found that stimuli were organized in the brain on the basis of word class, independently of differences in relationality[16], a crucial interface semantic property that directly constrains the morphosyntactic behavior of words. Furthermore, importantly, critical aspects of the neuroanatomical correlates of the three major word classes appear to be determined by a multifactorial and graded representation of these

[15] In the present paper, we deal with major word classes, also called open classes or content words, as opposed to function words, like determiners, conjunctions, prepositions, etc. We focus on verbs, adjectives and nouns, and leave out adverbs, as we do not have original data on adverb processing to discuss.

[16] Relationality entails an inherent relation between two (or more) elements (e.g., "mother" = relational vs. "table" = non-relational) and is manifested in the semiotic function of predication (e.g., verbs predicate something about someone or something, whereas nouns typically refer to a «first-order entities» (LYONS 1977), in the semantic valency (which determines argument structure and is, then, 1) and in the syntactic valency (i.e., the syntactic realization of the logical argument structure: VAN VALIN & LAPOLLA 1997). Relationality is a necessary property for verbs. In fact, besides the long debated issue of the impersonal verbs and the verbs with actant H, and the highly questioned case of verbs with no thematic relations (see LAZARD 1998, LANGACKER 2006, and the various contributions in FIORENTINO 2003, among others), which are largely beyond the scope of the present study, there are no verbs which do not establish an inherent relation between the denoted event and its participants and between the participants, or between the denoted event and its sole participant. For this reason, as prior neuroimaging studies revealed brain regions that selectively respond to verbs compared with nouns (SHAPIRO et al. 2006, BEDNY et al. 2008, WILLMS et al. 2011, PEELEN et al. 2012, among others), we wanted to test verb selectivity and, more comprehensively, word class selectivity against relationality. Relationality is crucial to verbs, but may be manifested also in other word classes (SCHACHTER 1985). In this study, relational adjectives do not specifically refer to the subclass of adjectives that are morphologically derived from and linked to nouns, such as denominal adjectives like Italian *cranico* "cranial", English *industrial*, French *presidentiel* "presidential": these adjectives, which have distinctive morphosyntactic features (MCNALLY et al. 2004; FÁBREGAS 2007), are also labelled as «relational» in certain theoretical frameworks, because they «express a relation between the noun on which they are formed and the noun with which they occur» (BISETTO 2010: 65). In the present study, the term relational has a more general sense (see RAMAT 2005: 76ff.) and applies to adjectives in the same way as to verbs and to nouns such as *destruction* and *mother*, and according with the notion of relationality related to the presence of one or more arguments in the logical structure of words (DOWTY 1979, VAN VALIN & LAPOLLA 1997): relational adjectives necessarily entail a logical relation between the modified entity and another notion (e.g., entity, event, condition: "this fruit is similar to peaches"), while non-relational adjectives do not (e.g., "fragile box").

categories. In fact, we found that: 1) adjectives have a midway representation between verbs and nouns: adjectives, in fact, are «a notorious swing-category» (Givón, 1979: 13) along the noun/verb continuum (Dixon 1977, 2004, Thompson 1988, Bath 1994, Wetzer 1996, Stassen 1997); 2) there is a distributed representation of all the three classes within each class-preferring set of brain regions. In particular, the adjective-preferring brain regions that are more anterior than verb-preferring regions are also next to (and partially overlapping with) the more anterior portion of the left lateral temporal cortex that has been implicated in the representation of states as opposed to activities, which are represented more posteriorly (Romagno et al. 2013, Peelen et al. 2012, Bedny et al. 2011). Adjectives, indeed, share more features with state relative to activity verbs: there are languages in which adjectives and states fade into each other (Lombardi Vallauri 2000).

The multifactorial and graded nature of verbs, adjectives and nouns can account for the distributed representations of word classes and, in parallel, for the inconsistency in neuroanatomical findings from previous studies (including mismatches between brain imaging studies on healthy population and lesion studies). Word classes differ along several formal and functional dimensions, including morphosyntactic, conceptual-semantic and pragmatic features, and semiotic functions. Neither a purely conceptual-semantic approach (e.g., verbs denote actions, while nouns denote objects) nor a purely formal approach (based on the «function-indicating morphosyntax», in Croft's terms: Croft, 1991) can provide a fully consistent explanation of the nature and the distribution of these classes either within or across languages. Formal features, in fact, are language-specific and vary in the way in which they are manifested in different members of a given class even within languages. Overlaps of formal features between categories occurr in many – if not all – languages and mismatches between lexical, morphological and syntactic categories also occurr (e.g., in Tongan: Broschart, 1997). A clear-cut distinction between word classes based on word meaning is not either possible, as verbs also refer to states/conditions (e.g., "to stay", "to exist") and nouns also refer to dynamic events (e.g., "destruction", "movement": «ὄνομά ἐστι μέρος λόγου πτωτικόν, σῶμα ἢ πρᾶγμα σημαῖνον» "a noun is a case-inflected part of speech that denotes a thing or an action/event", Dionysius Thrax, *Ars Gramm* 24.3). Nonetheless, it is possible to identify prototypical members of each class, by combining criteria from different dimensions: prototypes show a cluster of features shared by the other class members in different degrees.[17]

[17] To mention only some of the most representative contributions of a long tradition of research on word classes and categorization, see: GIVÓN 1984, HASPELMATH 2012,

To conclude, the data presented in this paper suggest a superordinate level of categorization, above the cluster of features defining a category (e.g., the word class noun, verb or adjective), that functions as an organizing principle of word knowledge in the brain. This principle operates in the actualization of grammar, as shown in §2, and is enacted prototypically. This can also account for the heterogeneity in neuroanatomical findings, as the superordinate taxon can be manifested at different levels and implemented in more or less prototypical instances, involving different dimensions and, nonetheless, operate in language processing, as also shown by cognitive neuropsychological dissociations and distinctions in the patterns of neural activation associated with nominal vs. verbal morphosyntactic contexts, that involve either homophones or pseudowords (see Shapiro & Caramazza 2003a, Shapiro et al. 2000, 2001, 2006, Gleason 1958). Therefore, instead of asking which is the critical difference between nouns and verbs that is captured in the brain and whether the neural underpinning of word classes relies on formal or functional grounds, we should, rather, more productively, adopt the perspective of multifactorial and graded categories, so as distinctions between them result to be captured in different areas of the brain, not necessarily involving (at the same time) all the dimensions and features along which they differ, and with possible overlaps and interleaved neural circuits due to the blurred boundaries between categories, the so-called «fuzzy categories», which include both prototypical and peripheral members (Rosch 1978, Lakoff 1987, Taylor 1995), and to the differential involvement of features and dimensions. This perspective does not undermine the principle of categorization that critically operates in the actualization of grammar, as manifested in the word class distinction, but, rather, enhances it by showing its internal structure and implementation.

2015, Sasse 1993, 2001, Simone 2000, 2003, 2008, Simone & Masini 2014b, Bisang 2010, Baker 2003, Ross 1972, Baker 2015, Lyons 1966, 1977, Croft 1991, 2005, 2010, Ramat 2005:61ff., 2009, Bossong 1992, Hengeveld 1992, Vogel & Comrie 2000, Aarts 2004, Marantz 1984, Hopper & Thompson 1984, Panagiotidis 2015, Newmeyer 1998, Lazzeroni 2012.

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ABSTRACT

The aim of the present paper is to provide a clear answer to critical aspects of the following key questions: 1) is word class-specification necessarily incorporated into lexical items? 2) does the organization of word knowledge in the brain rely on word class-specific information? To do this we combine diachronic evidence and typological observations on word classes with data on the noun/verb processing in aphasia and neuroimaging findings on the representation of verbs, adjectives and nouns and, consequently, show how linguistics and cognitive neuroscience crucially benefit from each other.