

The Lexical/Functional Divide in Aphasic
Production – Poorly Studied Aphasic Syndromes
and Theoretical Morpho-Syntax

The Lexical/Functional Divide in Aphasic
Production – Poorly Studied Aphasic Syndromes
and Theoretical Morpho-Syntax:
A Collection of Case Studies in Italian

By

Ludovico Franco

CAMBRIDGE
SCHOLARS

P U B L I S H I N G

The Lexical/Functional Divide in Aphasic Production – Poorly Studied Aphasic Syndromes
and Theoretical Morpho-Syntax: A Collection of Case Studies in Italian
By Ludovico Franco

This book first published 2014

Cambridge Scholars Publishing

12 Back Chapman Street, Newcastle upon Tyne, NE6 2XX, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Copyright © 2014 by Ludovico Franco

All rights for this book reserved. No part of this book may be reproduced, stored in a retrieval system,
or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or
otherwise, without the prior permission of the copyright owner.

ISBN (10): 1-4438-5816-1, ISBN (13): 978-1-4438-5816-8

This book is dedicated to the memory of my grandfather,
Ludovico Franco.

Per Salomè, Carlo e Daniele.

TABLE OF CONTENTS

Acknowledgments	ix
Preface	x
Chapter One.....	1
Not all Verbs are Created Equal, But all Verbs are <i>Light</i> :	
Evidence from a Case of Logopenic Primary Progressive Aphasia	
Chapter Two	31
The Regeneration of Syntax in a Case of Mixed Transcortical Aphasia:	
A-Bar Scrambling in Repetition	
Chapter Three	49
Prepositions Inside Words and the Syntax of Compounds:	
A Case Study with an Italian Agrammatic Speaker with Crossed Aphasia	
Chapter Four	78
A Probe to Check Evaluative Morphology in Agrammatic Crossed	
Aphasia	
Chapter Five	96
But what About when Predictions are “Wrong”?	
Linking Figure and Ground in Broca’s Aphasia	
Chapter Six	115
Conclusion	
Appendix 1-A	121
Samples of BB Spontaneous Speech	
Appendix 3-A	123
Full List of Items (ad Administered to SM)	
Appendix 4-A	131
Evaluative Nouns, Adjectives and Adverbs	

Appendix 4-B 140
Evaluative Verbs

Appendix 4-C 142
Evalutive Proper Nouns

Bibliography 144

Index of Names..... 177

ACKNOWLEDGMENTS

This book is a revised version of my (second) dissertation project at Università Ca' Foscari, Venice. I am grateful to my friend and colleague Elisa Zampieri, without whom this work would not have been possible. My colleagues and I have already disseminated several findings from the present research project at international conferences [*Science of Aphasia*, *Academy of Aphasia*, *Incontro di Grammatica Generativa*, *Verb2010*, *NPL-Aphasia 2012*, etc.] and in proceedings and journals. I am very indebted, for her helpful comments, to Anna Cardinaletti, my advisor, who followed this work from the earliest stages and to my PhD thesis committee: thank you to Paola Benincà, Andrea Marini and Francesca Meneghello. I also thank Carlo Semenza and Giulia Bencini for their help at IRCCS San Camillo. Very special thanks to Benedetta Baldi, Guglielmo Cinque (the *chair* of the committee of both my first and second dissertation), Rita Manzini, Luigi Rizzi and Leonardo Savoia. Finally, a word of gratitude to my family for their unflagging support.

PREFACE

It is well known that agrammatic individuals have difficulty with functional morphemes, including both free standing and bound morphemes, in production as well as in comprehension and/or grammaticality judgment tasks (classic works on the topic include Berndt and Caramazza, 1980; Caramazza and Zurif 1976, Parisi and Pizzamiglio 1970). These elements commonly include tense/aspect markers, plural markers, agreement markers, auxiliaries, etc. The same deficit has been observed in many different languages, and this fact has attracted the attention of researchers because patterns of deficit may possibly shed light on the (universal) neural mechanisms that compute grammatical morphosyntax (Avrutin 2001, Friedmann and Grodzinsky 1997, Grodzinsky 1990, Hagiwara 1995, Bastiaanse and Thompson 2003).

A significant amount of recent theoretical literature on the interface between morphosyntax and the Lexicon (see e.g. Hale and Keyser 1993, 2002, Halle and Marantz 1993, Marantz 1997, 2001, Mateu 2002, Harley 2005, Ramchand 2008, Manzini and Savoia 2011, among many others) has prompted us with a novel interpretation of traditional categories (and their *categorical* labels). In moving away from the long-established conceptualization of the categorical value of lexical items as an inherent / immanent feature, many contemporary paradigms of research share the idea that lexical categories are the result of the MERGE operation of an *acategorical* root element with a *light* functional category, whose lexico-semantic outlook (and the associated attributes) is determined on a configurational (constructionist) basis (see the classic work of Hale and Keyser 1993, 2002, Folli and Ramchand 2005, among others).

This shift of perspective has lead not only to a reconsideration of the innermost traits/textures of syntactic primitives and the essence of the Lexicon (see e.g. the seminal work of Borer 2005), but also to make available -even as a a tool-kit for experimental investigations- a very dynamic approach to what a lexical category can be: just to give an example, verbs may *embed* a nominal, adjectival or prepositional element (in e.g. *ingertative*, *resultative* or *locatum* verbs, respectively, following the path traced by the researches of Hale and Keyser), or have a *hybrid* nature, actually displaying a dual or *graded* nature (cf. the works collected in

Corver and van Riemsdijk 2001 for a wide range of issues concerning ‘categorical gradience’).

As we will see in this monograph, with rare exceptions, current neuro-linguistic literature does not take into consideration these theoretical advances. The rationale of the work is precisely to try to build a *bridge* between experimental evidence from clinical linguistics and theoretical arguments from morpho-syntactic analysis.

This book is structured as a collection of case studies all addressing the relationship between Lexicon and morphosyntax. We will try to show that various less-studied aphasic syndromes (e.g. Logopenic Primary Progressive Aphasia, Mixed Trascortical Aphasia, Crossed aphasia), and not only ‘classic’ Broca’s Aphasia can enhance findings worthy of consideration in contemporary theoretical debates on the status of *traditional* categories, and particularly on the lexical/functional divide in grammar. Note that in recent years (at least since Caramazza and McCloskey 1988) there has been a great resurgence of interest within neuropsychology in single case studies, which can be crucial in order to corroborate (or falsify) theoretical advancements in linguistics.

CHAPTER ONE

NOT ALL VERBS ARE CREATED EQUAL, BUT ALL VERBS ARE *LIGHT*: EVIDENCE FROM A CASE OF LOGOPENIC PRIMARY PROGRESSIVE APHASIA

Introduction

In this chapter we present a case of Primary Progressive Aphasia (PPA), which is a degenerative syndrome marked by a progressive deterioration of language functions and relative preservation of other cognitive domains (other than praxis) for at least two years after the onset, originally investigated by Mesulam (1982).¹ The spontaneous speech of our patient seems to support the idea of verbs as a closed class of *light* grammatical elements, as recently proposed by Kayne (2009) – drawing inspiration from the works of Hale and Keyser (1993, 2002). Since Jespersen (1965) the term “light verb” is a label used to refer to a class of verbs which is considered to be semantically empty, thus lacking enough thematic strength to independently act as predicates (for a detailed introduction of grammatical (light) verbs in a cross-linguistic and theoretical perspective we suggest referring to Mohanan 2007).

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 Wernicke’s areas, and increased activations of the left posterior frontal cortex and right hemispheric regions (cf. Sonty *et. al.* 2003). However, in another on-line

¹ According to Mesulam (2007, S8-9) the first clinical description of Primary Progressive Aphasia was done by Paul Sérieux in 1893 in a paper in which he presented the case of a woman brought to the hospital on March 11, 1891, who showed a progressive erosion of word comprehension and production and in whom “*la mémoire et l’intelligence de la malade étaient suffisamment conservées*”. The patient died in 1897 and her brain showed a bitemporal cortical atrophy and neuronal loss.

study of language processing, no significant differences emerge between patients with PPA and age-matched controls regarding the components of language networks, which were activated during on-line tasks. The sole relevant abnormality in PPA patients was greater neuronal activation outside the areas (e.g. Broca and Wernicke's areas), commonly considered part of the language network (Sonty *et al.* 2007). Clinico-pathological correlations in PPA emphasize the contributory role of dementia with Pick bodies and other tauopathies, TDP-43 proteinopathies, and Alzheimer disease (Grossman 2010). On the basis of the nature of language impairment, patients with PPA have been recently subdivided into semantic, agrammatic/dysfluent and logopenic subtypes (Gorno Tempini *et al.* 2004, Rogalski and Mesulam 2007, Mesulam *et al.* 2009, Bonner, Ash and Grossman 2010). The semantic variant is characterized by poor single word comprehension but relatively well-preserved fluency and syntax; the agrammatic / non fluent variant is characterized by poor syntax and fluency but relatively preserved word comprehension; and the logopenic subtype (originally identified by Gorno-Tempini *et al.* 2004) shows preserved syntax and comprehension; however, variable fluency and impaired single word retrieval (see also Grossman 2010). Mixed variants have also been described in the literature (e.g. Grossman and Ash 2004, Knels and Danek 2010). The connected speech of PPA patients, however, has often been dichotomized simply as fluent or non-fluent. A recent work by Wilson *et al.* (2010, 2069), however, points out that fluency is a "multidimensional construct" that encompasses features such as speech rate, phrase length, articulatory agility and syntactic structure, which are not always impaired in parallel.

Nevertheless, the single most common feature of PPA is a word-finding deficit, commonly known as Anomia (Goodglass and Wingfield 1997, Mesulam 2003). Patients *tagged* as non-fluent PPA have been reported to have greater difficulty naming verbs, whereas those with fluent PPA seem to have greater difficulty with nouns (Hillis *et al.* 2006). About the categorical gradience, however, of the anomic deficit in PPA – namely verbs *vs.* nouns production and comprehension – however, there is no unambiguous consensus in the literature. For instance, Graham, Patterson and Hodges (2004) found no evidence of reduced verb production in PPA patients.

An interesting fact -relevant for the present discussion- is that PPA patients often 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). Many PPA patients remain in an "anomic phase"

(Mesulam 2003) through most of the illness and experience a progressive intensification of word-finding deficits.

Other patients, however, develop distinct patterns of agrammatism and/or word comprehension deficits (Kertesz *et al.* 2005). Nevertheless, non-fluent PPA differs from descriptions of classic Broca's aphasia: Clark *et al.* (2005) have found only little agrammatism and no severe comprehension deficits among non-fluent PPA subjects. At final stages of PPA, vocalization is reduced to the point where only "incoherent grunts" (Mesulam 2001) or laughter-like automatic vocal outputs (Rohrer *et al.* 2010) are performed.

Outlining the research or why we need a "mirror image" of an agrammatic speaker

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 and Keyser 1993, 2002), we ideally need the "mirror image" of an agrammatic speaker, namely someone who has the functional morphology well-preserved and a deep anomia as well, affecting her Lexicon. In other words, we need a subject that could trigger a sort of "transparency effect" for morpho-syntactic derivations, in order to demonstrate if it is possible to address the noun *vs.* verb processing dissociation in aphasia (an inflated topic in the literature), starting from the consideration that nouns/lexical *roots* are primitives, while verbs are a "syntactic by-product".

An approximation of this ideal subject has been found in BB, a patient affected by logopenic PPA.² Her grammatical features (e.g. tense and

² Subjects with logopenic PPA have been reported to be variably fluent depending on the type of conversational frame or test being undertaken (Gorno-Tempini *et al.* 2008, 1228). Partly because of this variability, research groups have differed in their approach to classifying this variant of PPA. In addition to the peculiar speech and language characteristics, several associated cognitive and behavioral characteristics have been identified in the logopenic variant of PPA. With regard to neuropsychological profile, individuals with the logopenic variant have been observed to perform worse on tests of calculation than other PPA variants (Gorno-Tempini *et al.* 2004) and some cases, particularly those with Alzheimer's disease (AD) pathology, have demonstrated impaired performance on memory tasks (Mesulam *et al.* 2008). Impairment of limb praxis has also been noted (Rohrer *et al.* 2010). Studies examining abnormal behavioral characteristics associated with

agreement markers) are well preserved, so that her language production appears to be almost exclusively damaged by severe anomia.³

It is a widespread knowledge that 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 normally available to mark grammatical functions are impaired in that population, cross-linguistically (see Avrutin 2000, 2001, Menn and Obler 1990, Hagiwara 1995, Benedict, Christiansen and Goodglass 1998, Friedmann 2001, Wenzlaff and Clahsen 2004, 2005, Luzzatti and Chierchia 2002), while anomia is considered the hallmark symptom of PPA (Thompson *et al.* 1997, Rohrer *et al.* 2010).

Trying to schematically introduce our proposal, we argue for a split-hypothesis concerning impaired verbal production/comprehension. For us, the relevant dichotomy is "grammatical verbs" *vs.* "lexical verbs", and this breakdown has to be considered, prior to address the question and implications of nouns *vs.* verbs dissociation. As we have sketched above, in our view, lexical verbs are a product of syntax, specifically of a morpho-syntactic operation of incorporation (*conflation*, following Hale and Keyser terminology; see also Baker 1988, 2001, 2003a), while "core" (light) verbs are grammatical/functional heads.

We think that this simple shift is capable of changing the perspective on the "categorical debate" within the neuropsychological literature, where arguing for an intra-categorical dichotomy is actually the first step in order to naturalize what we consider to be the only relevant (binary) paradigm affecting the Lexicon: lexical (open class) *vs.* functional (grammatical, closed class) items (cf. Franco 2008, Kayne 2009). To sum up in a few words our view, we may say that not all verbs are created equal, and many previous experimental researches on the field could be misleading due to wrong starting assumptions. To check if we are on the right track a preliminary probe should come from raw hints along previous researches within the neuro-linguistic 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 the most salient features (for example,

each variant of PPA have identified apathy as a consistent feature in logopenic patients (Rosen *et al.* 2010). Additional behavioral features include irritability, anxiety, and agitation (Rohrer and Warren 2010).

³ As we will see, her frequent use of the verb *fare*, to do + *noun* resembles at a first glance the behaviour of those languages which make extensive use of complex-predicate constructions (the less exotic examples are possibly Persian and Urdu, for which see, respectively, Folli, Harley and Karimi 2005 and Butt 1995).

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 work), our data should find endorsements in the field of language acquisition and language creation, labelling under the language creation process, the formation of pidgins and 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 (Essegbey 2004), which makes extensive usage of serial light verb constructions (cf. on serial verbs Baker 1989, Cardinaletti and Giusti 2001, Carsten 2002, Collins 2002a, Aboh 2009). Other examples, just to name a few, include Saramaccan, a creole spoken by about 24000 people near the Saramacca and upper Suriname Rivers in Suriname (Veenstra 1996; cf. also Aboh 2005), Chinese Pidgin English (Sebba 1997) and many other Caribbean creoles (e.g. Leeward creole of Antigua and Barbuda, Jamaican creole, etc. see Durrelman-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 "*ik doe ook praten*" (I do also talk). These constructions resemble English do-support constructions where 'do' lacks a specific meaning (Radford 1990, Roeper 1992, Van Kampen 1997, Zuckerman 2001; see also Bottari, Cipriani and Chilosi 1993; Lightfoot 1999). Furthermore, it has been reported an early *flexible* usage of light verbs due to their initial categorial underspecification (at early stages of language development they seem to be used either as verbs or nouns, cf. Barner and Bale 2002).

Further 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 in a “native” Lexicon is a special derivation process involving a light verb in order to accomodate the item that has been borrowed (Wichmann and Wohlgemuth 2008). Independently from the perspective that can be adopted to explain the light verb spreading in the context of language acquisition, language creation and language contact (parameter setting, underspecification, pragmatically based accounts, etc.), the facts outlined above make us think that the “light verb” issue is a matter worthing of investigated within neurolinguistics, with special regard to language disorders.

The debate *over* categories

Psycholinguists and neurolinguists have begun to question the existence in the brain of traditional universal categories such as noun, verb, adverb or adjective (Vigliocco *et al.* 2011, Kemmerer and Eggleston 2010). As Vigliocco *et al.* (2011, 408) correctly observe:

“Grammatical class is highly correlated with meaning: objects in the world are generally referred to using nouns, and actions are referred to using verbs. It is the case, however, that across languages the correlation between semantics and grammatical class is not perfect. Nouns can refer to events (the walk) and both nouns and verbs can refer to abstract concepts (e.g. the love/to love). The powerful correlation between semantics and grammatical class has both theoretical and methodological consequences. The former will be addressed in the general discussion, the latter, because any study in which grammatical class and semantic distinctions are confounded cannot be interpreted univocally.”

From an historical viewpoint, since the mid-eighties of the last century, among neuropsychological studies of language (e.g. Miceli *et al.* 1984, 1988, McCarthy and Warrington 1985, Damasio and Tranel 1993, Hillis and Caramazza 1995, Bastiaanse and Jonkers 1998, Cappa *et al.* 1998, Kim and Thompson 2000, Luzzatti *et al.* 2002, Shapiro and Caramazza 2003, Aggijaro *et al.* 2006, see also Mätzig *et al.* 2009 for a comprehensive review), an assumed double dissociation between nouns and verbs emerged. We argue here for a radical change of perspective. The only relevant distinction is between lexical (*open class*) items and functional (*closed class*) items. From our point of view, for example, no meaningful distinction can be assumed for nouns and verbs both expressing the same “semantic target” (e.g. the run; to run), with the exception of possible morphosyntactic activation, when derivational/

inflectional morphology is involved. Neuro-imaging studies seem to strongly support an approach of this kind. In fact, once semantic matching is checked, only limited differences between processing nouns and verbs come out (Vigliocco *et al.* 2006, 2011, Siri *et al.* 2008). Greater activations for verbs than nouns in the left inferior frontal gyrus were reported in works that used tasks requiring, for instance, overt lexical decision (Perani *et al.* 1999) or semantic decision (Tyler *et al.* 2004), probably reflecting, as we have claimed, those morphosyntactic processes that may be more demanding for verbs than nouns. In fact, Siri *et al.* (2008) convincingly show that the left inferior frontal gyrus activation is not selectively linked to verb processing, but to the processing of inflected items in general. Notice also that there are recent findings which seems to show that the left posterior middle gyrus as well, together with the left inferior frontal gyrus, holds a crucial role in computing inflectional/derivational morphology (see Bornkessel and Schlesewsky, 2009).

The debate over category within theoretical linguistics is challenging and articulate. A recent influential hypothesis, advanced in Marantz (1997, 2001) within the Distributed Morphology (DM) paradigm and supported, from a psycholinguistic (and neurolinguistic) viewpoint, in Barner and Bale (2002) is that lexical categories are syntactically determined and bare “roots” are stored in the lexicon without any categorical specification. Thus, only after insertion in syntax (for the DM principle of *Late Vocabulary Insertion*, see e.g. Embick and Marantz 2008) the category of a given root is determined (*contra* this proposal, which assumes an underspecified Lexicon, see Don 2004, Panagiotidis 2005).

For the purpose of the present work we can take an agnostic position towards underspecification. To assume with Kayne (2009) and Hale and Keyser (1993, 2002) that all “verbs are light verbs” implies, however, an underlying underspecification of lexical verbs which are derived by conflating/incorporating an open class (lexical) complement in an abstract (closed class) functional head.

The relevant issue here is nevertheless the distinction between closed-class/function words (which play a grammatical role) and open-class encyclopaedic items (which can be infinitely augmented by new coinages/borrowing). This (binary) opposition is possibly the only relevant prime available to our syntactic module. As Von Stechow (1995, 176) has argued, it seems that “functional categories are what grammar is all about”, while lexical items are somewhat “inert” in syntax. Furthermore, Talmy (1985), within the domain of cognitive linguistics, claims that function words cross-linguistically show a recurrent set of semantic distinctions, while the lexical words are more culture-specific.

The crucial property of open class items according to Kayne (2009) is *denotation*, which irrespectively involves nouns (see also Baker 2003a) either if they are orientated towards an object or a state or an event (states and events can be functionally encoded, see e.g. Ramchand 2008, Borer 2005).

Given the open vs. closed class dichotomy, it is clear that comparing nouns vs. verbs processing is senseless, while a fine-grained analysis inside what is known as the verbal category can lead us to a better understanding of the way in which a syntactic derivation take place. Significantly, it is worth noting that linguistic typologists have autonomously undermined the classical notion of syntactic categories, which result in becoming vacuous *tags* (see e.g. Gil 1994, 2000, Haspelmath 2007, Evans and Levinson 2009). In the words of Evans and Levinson (2009, 435):

“There are [...] languages without adverbs, languages without adjectives, and perhaps even languages without a basic noun-verb distinction. In the other direction, we now know that there are other types of major word-class – e.g., ideophones, positionals, and coverbs – that are unfamiliar to Indo-European languages”.

We will introduce below the theoretical framework(s), which are the axes of the present experimental research (and basically of the whole experimental work of the present monograph).

Theoretical background

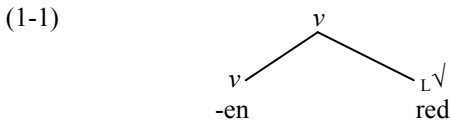
The L-syntax of Hale and Keyser (1993, 2002)

In this section we explain the reason why we agree with the proposal of an argumental structure without thematic roles as primitives, instead deriving thematic interpretation from syntactic position (akin to Hale and Keyser 1993). Hale and Keyser’s (1993, 2002, *henceforth* in this chapter: H&K) approach to grammar is a principled manner to thrash out theta theory (cf. also Harley 1995). H&K (2002, 68) say that there essentially are no theta-roles, arguing that

“While we might assign a particular thematic label – say, “agent” – to the Noun Phrase [...], its grammatical status is determined entirely by the relation(s) it bears in the relational structure projected by the head V”.

Nevertheless, from our viewpoint, the most relevant feature of their work is that they offer original evidence for a dynamic role of a light verb

[*v*] projection, which has become a pivotal element within the Minimalist Program (Chomsky 1995, 2000), arguing, possibly, that these [*v*] projections are not above the verb, but inherently a (series of) verb(s). Their key idea is that a lexical root “conflates” – through (a set of) head movements (see also Matushansky 2006) which obey to the Head Movement Constraint (an X^0 may only move into the Y^0 that properly governs it) – with an empty (or nearly empty) verbal head to form a verb, as shown below:



In (1-1), for instance, the adjectival root *red* fuses with verbal functional head *-en* to form the (deadjectival) verb *redden*. H&K do not explicitly address the question concerning the functional status of the verbal head, but given this idea of verb formation as a syntactic (dynamic) process, it follows that verbs are not stored in the lexicon, which is the place for lexical roots. Moreover H&K (1993, 2002) do not explicitly claim for a lexical underspecification, in fact H&K (2002) argue for a predictable syntactic configuration of classical categories such as adjectives, nouns and prepositions. Nevertheless, their main idea of a constructionalist way to account for verbal formation in syntax, matches our claim that anomia, blocking the conflation process (due to the unavailability of the lexical root, impossible to be accessed/retrieved), resurface the functional verbal head (at least in those cases where the syntactic computation is not heavily affected). This may be especially evident for unergative (intransitive) verbs. Coming back to H&K (2002) view, which involves canonical categories, they argue for the existence of two fundamental relations in argument structure: the head-complement relation and the spec-head relation. These two relations give rise to four structural types of lexical argument structure: a head which needs a complement (such as a verb), a head which needs a specifier (such as an adjective), a head which needs both (such as a preposition), and a head which needs neither (such as a noun). We do not enter into further details, concerning the analyses H&K give, which are not strictly relevant here.

It is important, however, to clarify the notion of conflation, which the authors describe as a “concomitant of Merge” or the “fusion of syntactic nuclei”. Hence, for H&K, the lexical root moves into the categorial head at the same time as Merge, and they take this approach for practically all

(lexical) denominal and deadjectival verbs, with a set of data from languages such as Navajo (Athapaskan), Ulwa (Misumalpan), Tohono O’odham (Uto Aztecan), and Hopi (Uto Aztecan). Up to now, we have used conflation and incorporation as synonyms, but even if similar to incorporation, conflation - in fine grained syntactic terms - differs in at least one crucial side: “a verb cannot ‘conflate’ with the specifier of its complement” (H&K 2002, 103). Conflation, due to its selectional nature, is a strictly local relationship between a verb and the head of its complement, while incorporation (Baker 1988) admit a configuration of a specifier that “jump up” into the higher head, preceding it. Given this clarification, we think that here we may interchangeably use the two terms, assuming the basic fact that they both involve a syntactic derivation that gives rise to morphologically complex elements.

An interesting consequence of H&K proposal is that, taking conflation as a (morpho)syntactic operation, we may argue for its parametric application [+/- conflation] among natural languages (notice that in the same language, conflation can also be somewhat “parametrically” applied; take the case of kinship terms in Italian: *fare un/a figlio/a* – *figliare* (both: to have a child), both grammatical vs. *fare il (da) padre* [√]; **padrare* [ungrammatical] (possible translation, do the father’s work). This fact, in turn, leads to the (high) probability that a set of languages can show a closed class of functional items, which do not incorporate, hosted in verbal heads. From 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 of elements (Dixon 2004, Baker 2003a), the claim that verbs can be a closed class may appear controversial. But, as observed in Cinque and Rizzi (2010a, 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”.

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 do not have simple verb counterparts (Megerdumian 2002) and the already mentioned Folli et al. (2005) have

showed that Persian can be considered as a transparent instance of Hale and Keyser's "constructionalist" model. In addition, Schultze-Berndt (2006) reported that Karimi (1997, 276) states that the complexive number of verbs in contemporary Persian does not exceed 115, while Haig (2000) states that verbs in Kurdish are a closed class, according to the results of a text count where only 60 verbs account for over 96% of all verb tokens. A somewhat different instance of light verb construction is found in a number of Northern Australian and Papuan languages, where the host element paired with a verb is not a (canonical) nominal, but comes from an open class of underived (underspecified) predicative elements, termed *coverbs* (see Pawley 2006). Other examples of languages that adopt a strictly functional verbs' strategy are Urdu (Butt 1995), Hindi (Mohan 2007), Amharic (Amberber 2010) and some South-American languages (e.g. Mosele, see Sakel 2007).

A Lexicon without verbs (Kayne, 2009)

Turning to recent applications of H&K work, without entering into technical details, we need to introduce Kayne's (2009) work, which germinates from Kayne's (1994) groundbreaking Linear Correspondence Axiom (LCA). Roughly, some of the most interesting syntactic consequences of the LCA, which argues for a strict relationship between hierarchical structure and linear order in language, are the following: (i) syntax obeys a rigid X-bar schema where any projection of a given head may host only a complement and a Specifier (or adjunct), hence not allowing multiple Specifiers/adjuncts projected by a head; (ii) there are no distinctions between specifiers and adjuncts; (iii) precedence-relations in Phonological Form-strings must be in a rigid one-to-one correspondence to c-command relations, constrained in a universal Specifier-Head-Complement order (namely, *Antisymmetry*).

If the latter principle holds, then a logical consequence as a result is that every exception from the Specifier-Head-Complement schema (e.g. the widely attested head-final word order such as in Japanese or Kannada), must to be restated in antisymmetric terms, involving a set of functional heads, triggering syntactic operations. Hence, Antisymmetry enhances the role of grammatic elements; for instance Kayne (1994, 29) argues that: "functional heads make landing sites available". It is possible to argue against this "inflation" of arbitrary functional heads (see for example Fukui 2006), but recent developments in the antisymmetric framework (see Kayne 2009) seems to rule out any possible issue, implicitly arguing for a constraint *ex ante* on Merge (the base operation of grammar in the

Minimalist Program) which is possible only through grammatical classes/devices (see also Franco (2011a), that explicitly addresses this issue), which hold unvalued features and are the *loci* (cf. also Collins 2002b) of parametric variation.

Leaving aside the technical details of Kayne's (2009) proposal, it follows from this dichotomy on Merge that only *denoting* elements, which enter the derivation with no unvalued features, can be considered to be representative of an open class of lexical items. For Kayne no class other than nouns can meet this criterion. Hence, explicitly aiding our claim that verbs as inherently functional items, Kayne basically states that: "all verbs are light verbs". Specifically Kayne (2009, 8) says that:

"Falling under 'non-noun' are at least verbs (and aspectual heads), with the apparent paradox that verbs are normally thought to belong to an open class. That paradox needs to be rethought, however, in light of Hale and Keyser's (1993: 55) proposal concerning *laugh* and similar items. For Hale and Keyser there, English *laugh* is a noun that in some sentences co-occurs with a light verb that is unpronounced, giving the (misleading) impression that *laugh* in English can also be a verb. Strictly speaking, though, *laugh* is invariably a noun, even when it incorporates (in some sense of the term) into a (silent) light verb".

The most important consequence of Kayne's proposal, relevant to the issues raised in our work, is that the only significant and productive distinction in grammar is between functional and lexical elements. This fact can be easily inferred from the set of possible linguistic impairments: for instance, a deficit that selectively involves, let say nouns together with tense morphology on verbs, has never been detected (something that is not impossible *a priori*, but very unlikely to happen, given the lexical/functional *rift*).

The noun vs. verb dissociation (as said above, a *core* issue in the neurolinguistic literature), in our view, must be restated, and we have possibly only two options: (i) nouns are the only *loci* for denotation (they are the only real open class) and all (heavy) verbs are, in a sense, "denominal" items; (ii) we need to assume a pattern of lexical underspecification, and every lexical process is mediated by the involvement of functional devices (Halle and Marantz 1993, Marantz 1997, Barner and Bale 2002, Pensalfini 2004, Borer 2005, Arad 2005 among many others).

The cartographic legacy

We have presented so far the two main theoretical axes that provide the basis for our investigation; however, there is a third, underlying framework we are applying here: the cartography of syntactic structure, developed, as a shunt from the government and Binding research paradigm, since the mid-nineties. As effectively summed up by Endo (2007, 4):

“Cartographic approaches to syntactic structures aim at drawing a map, as detailed as possible, of the functional (or grammatical) structure of the clause and of its major phrases”.

Notably, the underlying assumption of cartography (explicitly emphasized in the work of Cinque (1999, 2006a; see also Cinque and Rizzi 2010a) is that all languages share the same grammatical categories and the same principles of phrase and clause composition (Kayne 1994), although they differ in the syntactic operation (e.g. movement) that they allow and in the projections that are overtly realized (Cinque 2006a, 4-5). It is most likely that the main trigger of the cartographic paradigm was, according to Cinque and Rizzi (2010a) the “explosion” of functional heads identified and implied in syntactic analyses, since the mid--eighties of the previous century, within the Government and Binding framework (Abney 1987, Larson 1988, Pollock 1988). One further crucial point was the extension of the X-bar theory to the functional elements of the clause (Chomsky 1986) as a CP > IP > VP structure. These theoretical bases set the stage for cartography: the study of the structure of both phrases and clauses as hierarchical sequences of the same chunk, the fundamental X-bar schema (or, in a minimalist shape, the simple, recursive application of Merge).

Within the cartographic paradigm the most *embedded* occurrence of these building chunks is the projection of a lexical item, and this lexical item is subsequently merged with a series of chunks headed by functional items, providing more abstract semantic-pragmatic specifications to the intrinsic reference of the lexical head. Some possible instances are tense, mood, aspect, voice above the verb, or definiteness, number, specificity, for the noun. Notice, that the somewhat latent opposition between functional and lexical categories presupposed by this paradigm of research has been an important trigger for the development of our reductionist hypothesis. Possibly, the most important research in the cartographic paradigm is the work of Cinque (1999), which represent a systematic cross-linguistical analysis of adverbial positions, leading to a strict

unambiguous universal hierarchy, which reflects the universal hierarchy of functional heads expressing properties of tense, mood, aspect, voice, etc. Tense, aspect, mood, voice etc. can be expressed in natural languages either by morpheme (bounded or unbounded) or by functional verbs, hosted in the heads' position of the functional projections above V.

It stands to reason that the richness of postulated positions could be a critical difference with respect to the Minimalist Program (Chomsky, 1995, 2000, 2001, 2005, 2008) but as Cinque and Rizzi (2010a, 59-60) states, cartographers:

“believe that there is no contradiction between these two directions of research, and the tension, where real, is the sign of a fruitful division of labor [...]. Minimalism focuses on the generating devices, and cartography focuses on the fine details of the generated structures, two research topics which can be pursued in parallel in a fully consistent manner, and along lines which can fruitfully interact [...]”.

Unaccusative verbs and the lexical/functional divide

For the sake of the present discussion we have to say that, following the *Unaccusative Hypothesis*, natural languages distinguish between two classes of intransitive verbs: unaccusatives and unergatives (see Perlmutter 1978, for the original proposal and Burzio 1986, for the first generative account). In semantic terms, the assumed difference is based on this fact: the subject of an unaccusative verb, unlike the subject of an unergative - which instead is really the Agent of the verb – bears the semantic role of the Patient, that in less *marked* conditions, is related to the object. Hence, according to the Unaccusative Hypothesis, the single argument of unaccusative verbs is, syntactically, a direct object, while the only argument of unergatives is, syntactically, a subject.

Given this background, before introducing our Case Study, a relevant question needs to be addressed: where can we insert unaccusative verbs along our lexical/functional (polarized) axis?

As introduced above, an unaccusative verb is an intransitive verb whose (syntactic) subject is not a (semantic) agent and an unaccusative verb's subject is semantically similar to the direct object of a transitive verb, or to the subject of a verb in the passive voice. Our proposal is that at least core uncontroversial) unaccusatives are functional elements and they are base generated in a functional X^0 , which is analogous to the one hypothesized for light verbs. We will see below that our hypothesis will be confirmed by experimental evidence. Notice that, as sketched above, we consider only *core* unaccusative (e.g. come, go, that are notably used as

auxiliaries in non interrelated languages; consider the Italian example: *questo libro viene letto*, this book is read, lit. *this book comes read*) because it has been suggested that the representation of (some) unaccusative verbs requires some kind of lexical derivation, due to the fact that frequently these verbs with a surface unaccusative (ergative) realization are admittedly correlated to transitive predicates (e.g. break, roll).

This derivational view of unaccusativity, which *prima facie* contrasts with our hypothesis, has been developed, for instances, in works by Reinhart (1997, 2000) and Pesetsky (1995), but as we have said above we can by-pass the issue, arguing for a split-unaccusativity: *core* unaccusatives vs. *ergative* unaccusative. In Reinhart's and Pesetsky's accounts, unaccusative verbs are the results of lexical operations which suppress (or adopting an old Relational Grammar view and terminology, *demote*, see Perlmutter and Postal 1984) the agent of the corresponding transitive instance of the verb. We ask the reader to refer to Levin and Rappaport Hovav (1995) for a detailed introduction to the matter.

What follows is a brief review of the neurolinguistic literature devoted to explore the unaccusative puzzle, which also aims at demonstrating that previous findings cope with our claim that the unergative/(core)unaccusative is first of all a matter of [+/-] morpho-syntactic derivation: in our view unaccusatives are base grammatical verbs, while unergatives are a by-product of a light verb incorporating with a lexical root.

We would like to open our review with an exciting fact discovered by Froud (2006), who has reported a significant amount of data from an aphasic subject who was unable to read any function words, with a characteristic pattern of "within-category" substitutions; his errors deeply extended to the class of unaccusative verbs. Thus, this deficit seems to provide evidence (a welcome result for us) in support of a functional determination of unaccusativity. As expected, it emerges from Froud (2006) that auxiliaries and modal and aspectual verbs behave like unaccusatives. An influent hypothesis concerning the performance (in production and comprehension) of aphasics with unaccusative predicates is the one developed in Thompson (2003) and Lee and Thompson (2004), where they find that in contrast to relatively spared comprehension of both unaccusative and unergative intransitives, the agrammatic subjects showed significantly greater difficulty producing unaccusatives as compared to unergatives.

This is an interesting result, because it is coherent with the findings in Barde *et al.* (2006) where a greater difficulty producing light(er) verbs has

been detected. Notice that among the light verbs included in Barde et al. (2006) corpus there were, as expected, what we have labelled as [core] unaccusatives. Another relevant fact that Thompson (2003) puts in evidence is that agrammatic patients showed fewer productions of unaccusative verbs in their narrative samples as compared to other verb types (supporting what was reported in Kegl 1995). Thompson (2003) argues from these findings that deficits in accessing verbs for production are influenced by argument structure template of the verbs involved, optimising her “argument structure complexity hypothesis”, which basically claims that when verbs become more complex in terms of the number of associated arguments, or when the argument structure entry of the verb does not directly map to its S-structure representation (building on a version of Government & Binding framework), production difficulty increases.

Her hypothesis even if intuitively plausible (generating a model that explain a pattern of this kind: more complexity, more difficulty) can be weakened by the simple consideration that there are languages in which the sole unaccusative argument is able to (productively) retain its base position.

Materials and methods of the experiment

Subjects

As we have specified above, we needed an anomic patient with no syntactic difficulties in order to perform the research. BB is a 59 year-old right-handed woman, living in Murano (a little island in the Venetian lagoon). She attended a *liceo*, specializing in classic studies and then studied foreign languages for some years at Ca' Foscari University of Venice, without completing her studies. She lived in London for about one year and in Egypt for six months. For many years she has been working as a tourist guide in Venice, and then as an employee in an office.

She arrived at San Camillo Hospital, Venice in January 2009, because of serious linguistic problems, especially in word finding, which particularly affected her ability in common names naming.

The patient's language screening was carried out in winter/spring 2009 with standard batteries for Italian speakers. The standard batteries we used were the Italian version of A.A.T (*Aachener Aphasia Test*; Huber et al. 1983), B.A.D.A (*Batteria Analisi Deficit Afasico*; Miceli et al. 1994), Pyramids and Palm Trees Test (Howard and Patterson 1992), Boston Naming Test (Kaplan, Goodglass and Weintraub 1983) and Mini-Mental State Examination (Folstein, Folstein and McHugh 1975).

BB was diagnosed with Logopenic PPA, according to the classification given in Gorno Tempini *et al.* (2008), who argue that:

“In Logopenic PPA, speech rate was slow, with long word-finding pauses. Grammar and articulation were preserved, although phonological paraphasias could be present. Repetition and comprehension were impaired for sentences but preserved for single words, and naming was moderately affected” (Gorno Tempini *et al.* 2008, 1227).

The most typical features the screening of BB revealed were: difficulties with objects and compound-words naming and mild impairment in both oral and written comprehension of sentences. Moreover, the initial analysis revealed an expected deficit in word finding, but also some problems with syntactic interpretation/comprehension (especially with passive sentences).

The administration of A.A.T. underlined a slight deterioration of BB language faculty. The worst performance concerned tasks of linguistic production, in particular with naming, pictures descriptions. Errors consisted mostly of complete anomia (no response) or phonemic paraphasias, suggesting a mixed mechanism of paraphasic and word-selection anomia, a fact already observed on the literature on logopenic PPA (cf. Gorno-Tempini *et al.* 2008). Comprehension at the sentence level was mildly impaired, but there was no clear evidence of a structural complexity effect. Single-word repetition was largely preserved, whereas sentence repetition was severely impaired, especially for low-probability sentences.⁴ Boston Naming Test confirmed the word finding deficit, but her performance with the Pyramids and Palm Trees Test was only very mildly impaired, excluding a semantic memory cause for her lexical-access problem. She scored 26 on MMSE. See Table 1-1 for data concerning functional and cognitive assessment of BB.

⁴ Recent work by Wilson *et al.* (2010) indicates that several key characteristics of logopenic patients' spontaneous speech can be helpful in differentiating these patients from ones with other PPA syndromes. Based on a speech sample, logopenic patients can be distinguished from nonfluent patients by a lack of speech sound distortions (although phonological paraphasias may be present) and *frank* syntactic errors. In addition, the maximum speech rate is typically greater in logopenic relative to nonfluent variant patients. The logopenic variant can be distinguished from the semantic variant by relatively slower maximum speech rate and by the presence of phonological paraphasias. These facts indicate that the logopenic variant of PPA can be differentiated from other PPA variants based on performance on a simple picture description task or other speech sample (cf. also Henry and Gorno-Tempini 2011).

Table 1-1. Cognitive assessment of BB

Test	Raw score	Normative data* Mean (SD)
MMSE	26	27.7 (2.6)
Token Test	28	32.69 (3.21)
Digit span forward	4	5.84 (1.09)
Digit span backward	2	4.47 (1.19)
Corsi span	3	4.69 (1.11)
Pyramid and Palm Tree picture [% correct]	96	
Raven Matrices	21	28.82 (9.52)

* Cognitive scores were compared to published normative data, where available. SD = standard deviation.

Spontaneous speech production (cf. Appendix 1-A for the transcription of a samples of her spontaneous speech) was characterized by slow, hesitant speech with word-finding pauses. Speech in response to a picture was characterized by decreased rate and occasional phonemic paraphasias and word-finding difficulty (a feature consistent with a diagnosis of Logopenic PPA, cf. Henry and Gorno Tempini 2010). Sentences were simple, but grammatically well formed and without omission of grammatical morphemes. Motor speech abilities were within normal limits, and no apraxia of speech or dysarthria was noted.

Four control subjects, two men and two women, were involved in the present study. They matched with the subject for age and age of instruction and did not have any physical, neurological or psychological problem.

Stimuli

At the stage of the illness that we have considered for our analysis, BB was still able to carry on a conversation and to produce sentences composed by many words. We have chosen a *spontaneous speech modality* experiment, as an ecological tool to collect our data. Naming tests were problematic because of the great difficulties we found in drawing some verbs – above all the functional ones. Also, completion tasks could have been problematic, because it would have been impossible to create an obligatory and unambiguous context for each type of verb.

Moreover, we had already preliminarily observed that in BB's spontaneous speech there were many sentences containing functional verbs with a noun or with an infinitival verb. For example, she used many modal verbs and very few lexical verbs, and she often omitted the lexical part of a construction. We need to experimentally confirm this simple