

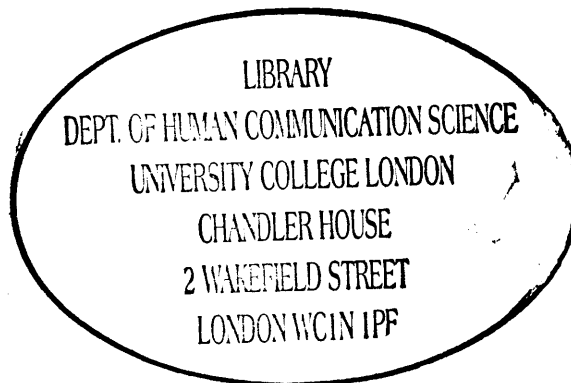
TEGOU

FOR
REFERENCE ONLY



**OBJECT AND ACTION NAMING IN GREEK APHASIC
PATIENTS
AND THE EFFECT OF VERBS WITH ALTERNATING
TRANSITIVITY AND INTRANSITIVE CONSTRUCTIONS
IN GREEK LANGUAGE**

GEORGINA TEGOU



SEPTEMBER 2007

Submitted in partial fulfilment of the MSc in Human Communication

Department of Human Communication Sciences

University College London

UMI Number: U593897

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



UMI U593897

Published by ProQuest LLC 2013. Copyright in the Dissertation held by the Author.
Microform Edition © ProQuest LLC.

All rights reserved. This work is protected against
unauthorized copying under Title 17, United States Code.



ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

Abstract

The primary aim of this project was to investigate object and action naming in aphasic patients in Greek language, which distinguishes morphologically between nouns and verbs. Moreover, it aimed to explore the differences in patients' use of nouns and verbs in connected speech and compare their availability in both picture naming and connected speech. Furthermore, it investigated different verb categories, such as those with alternating transitivity, and intransitive verbs. Claims were made of whether different verb categories such as unaccusatives are more difficult than others in Greek, as it has been found in current literature for other languages. The aims of the project arose from the theoretical background that relates to aphasia and dissociations between nouns and verbs, as well as from the debate regarding the transitivity effects of verbs and the interference of underlying syntactic movement operations in the production of unaccusative verbs. Both debates on noun and verb differences and on transitivity and unaccusativity still remain unresolved.

Nine Greek speaking Broca's aphasic patients and nine neurologically unimpaired individuals, matched for age and years of education, participated in the study. For the naming study, a Greek adaptation of the Object and Action naming Battery (Druks and Masterson, 2000) was used and the participants' performance was analyzed in terms of errors and latencies. Picture description and spontaneous speech data was also collected and analyzed. For the investigation of the patients performance in the production of verbs with alternating transitivity and unaccusative and unergative intransitive verbs two sentence completion tasks were implemented. Results in naming study were found to be consistent with current literature claiming that action naming poses greater and different demands on the language process than object naming. However, in the study of unaccusative verbs, different findings from the current literature emerged which were discussed in relation to methodology used in eliciting such complex constructions.

Abstract -

presentation - sentence completion tasks - picture naming

changes and

Acknowledgements

This project would not have been possible without the kind permission from the Rehabilitation Centre “Anagennisi” in Thessaloniki, Greece and particularly without the co-operation, support and assistance of the Speech and Language Therapy (SLT) Department.

Special thanks are due to Dr Harikleia Proios (PhD, CCC - SLP) who contributed in the recruitment of the patients as well as in the clinical diagnostic assessments.

Thanks are also due to my supervisor Dr Judit Druks (Senior Lecturer, University College London) for her support, assistance and patient advice during the past year.

Finally, to all the participants, and most truly to patients and their families, thank you for your enthusiastic participation which made this project possible.

Table of Contents:

1. Introduction

- 1.1. Verbs and Nouns, an ongoing debate
- 1.2. Naming Studies
- 1.3. Object and Action Naming in Greek
- 1.4. Intransitive verbs and verbs with alternating transitivity

2. Methodology

- 2.1. Participants
- 2.2. Background information about patients
- 2.3. Spontaneous speech
- 2.4. An Object and Action Naming Study
 - 2.4.1. Materials
 - 2.4.2. Procedure
 - 2.4.3. Results
- 2.5. Verbs with alternating transitivity, a sentence completion task
 - 2.5.1. Materials
 - 2.5.2. Procedure
 - 2.5.3. Results
- 2.6 Intransitive Verbs, a sentence completion task
 - 2.5.1. Materials
 - 2.5.2. Procedure
 - 2.5.3. Results

3. Discussion

- 3.1. Discussion of naming study
- 3.2. Discussion of the verb study

4. Conclusions

References

Appendices

Appendix I: Extracts of patients' spontaneous speech

Appendix II: Items used in the Greek version of the Object and Action Battery

Appendix III: Sentence Completion Task Items.

Appendix IV: Error prone items in the Object and Action Naming Study

List of Tables

Table 1: Demographic information about patients and comparison group

Table 2: Diagnostic and background information for the aphasic patients

Table 3: Patients speech characteristics

Table 4: Item characteristics of the action and object pictures and their verbal labels in the Greek version of the OAB (Bogka et al., 2003)

Table 5: Mean naming latencies of patients and comparison group in msec (SD in brackets)

Table 6: Number of errors in object and action naming made by the patients and comparison group

Table 7: Examples of errors of actions and objects made by the patients

Table 8: Number of errors and percentage error, according to error type, for the patient group

Table 9: Number of errors and percentage error, according to error type, for the comparison group

Table 10: Ergative verbs used in the sentence completion task

Table 11: Correct responses in the sentence completion task of verbs with alternating transitivity

Table 12: Intransitive verbs used in the sentence completion task

Table 13: Correct responses in the sentence completion task of intransitive verbs

1. INTRODUCTION

1.1. Verbs and Nouns, an ongoing debate

The past few decades have witnessed an ongoing debate with regard to nouns and verbs and how these two grammatical categories are used by different populations. The two categories appear with representational and processing differences in most populations, those with a language impairment and those with not. It has been widely argued that verbs are more difficult than nouns. Evidence from young neurologically unimpaired individuals (Bogka, Masterson, Druks, Fragioudaki, Chatziprokopiou, Economou, 2003), and elderly neurologically unimpaired adults (Druks, Masterson, Kopelman, Clare, Rose, and Rai., 2006) shows that verbs are processed with greater difficulty than nouns. Data from language acquisition provides evidence that the acquisition of these two grammatical categories happens in a very different way and in different periods of the acquisition of language (Gentner, 1981, 1982) with verbs being acquired after nouns. According to Gentner (1982) there are several reasons for verbs being more difficult than nouns, which have become obvious through language acquisition research. One of these is that nouns tend to label more individuated and less relational referents than those labelled by verbs. Snedeker and Gleitman (2004) have suggested that the imageability of the referent is also a key distinction, with nouns tending to label more imageable referents. Tomasello (1992) has argued that the difficulty of verbs lies in that they label referents which “unfold in time”. Finally, Maguire, Hirsh-Pasek and Golinkoff (2006) suggested that there is in fact a combination of factors to account for this, which indeed include imageability, but also concreteness, individuality, and shape all of which making noun referents more perceptually accessible and therefore easier for conceptual learning and mapping (Hirsh-Pasek and Golinkoff, 2006).

Separate from data acquisition evidence, semantic organization and grammatical complexity are the main reasons for processing difficulty of action naming compared to object naming (Bogka et al., 2003). The semantic organization of nouns appears to be hierarchical and concrete nouns that belong to a specific category, tend to share many semantic features. The semantic organization of nouns has been considered to be less complex than that of verbs, which tend to have a matrix-like organization, and are classified in much shallower semantic fields, sharing less semantic features among the categories. (Huttenlocher And Lui, 1979). The grammatical complexity of verbs might be yet another reason for the difficulty that verbs present in comparison to nouns. According to Hirsh-Pasek and Golinkoff (2006), verbs are the architectural grammatical centrepiece, and determine the sentence's argument structure (Hirsh-Pasek and Golinkoff, 2006). However, their argument structure seems to have a detrimental effect in patients with aphasia (Kim and Thompson, 2000; Thompson, 2003). With regard to the imageability factor, Bird et al have highlighted that concrete verbs are considered less imageable than concrete nouns and therefore the difficulty in verb processing and performance in picture naming relates to their low imageability (Bird et al., 2003). Finally, the increased intricate morphology of verbs in comparison to nouns as apparent in most languages (Vigliocco, Warren, Arcuili, Siri, Scott, Wise, 2006) might be responsible for their relative vulnerability in relation to nouns.

It has moreover been proposed that verbs are represented in the more anterior regions of the brain whereas nouns in posterior regions (in Maetzig and Druks, 2006). It can therefore be hypothesized that neurological impairments may affect nouns and verbs in different ways. Recent literature highlights the study of aphasia and its relation to selective impairments of nouns and verbs in research. It has been shown that different types of aphasia have different consequences to the availability of nouns and verbs. There is much evidence to show that agrammatic patients are more vulnerable to

verb deficits (McCarthy & Warrington, 1985; Miceli et al, 1984; Miceli et al, 1988; Zingeser & Berndt, 1990) whereas, anomic patients have more difficulties in producing nouns (Zingeser & Berndt, 1990). Yet, this pattern does not always hold true, resulting in exceptions where anomic patients present with selective verb deficits. Consequently, a larger proportion of patients have verb deficits, irrespective of their type of aphasia. Therefore the relationship between patients' diagnostic classification and noun or verb deficit is still not entirely predictable (Maetzig, Druks, Masterson, Vigliocco, 2007).

In order to explain the underlying reasons of the selective noun and verb deficits, one must examine the level of language processing which is implicated. Selective verb and noun deficits could reflect a problem at conceptual level, since it concerns objects and actions being labelled by concrete nouns or verbs respectively. This would be regarded as a conceptual semantic deficit rather than a difference between nouns and verbs as grammatical class (Druks, 2002; Maetzig et al., 2007). Differences in verb and noun-processing could also appear at lexical level, occurring either at the lemma selection stage, or at the lexeme retrieval level (Levelt, 1989; Levelt et al, 1991, 1999 in Kambanaros 2007; Druks, 2002). However, it appears to be only the difference between verbs and nouns' grammatical class since in this level, and in contrast to the conceptual level, it is both concrete, as well as abstract representations that are implicated and it is abstract words that distinguish nouns and verbs from objects and actions. A lemma is an abstract representation of the word, which is conceptually driven. It consists of semantic and syntactic properties such as a set of conceptual conditions related to the message, as well as syntactic specification elements like category, subcategorization information and the conceptual arguments. A lexeme, on the other hand, constitutes the phonological representation of the verb or noun lemma, which contains information about phonological properties such as number of syllables, prosody, segmentation, as well as the morphological properties of the word (Levelt, 1989). Verb and noun deficits

may arise due to disruption at either one of these levels. However, as Druks (2002) argues, a complexity that emerges is that the locus of verb and noun dissociation is not the same for all patients. The difficulties in verb processing that agrammatic patients present with, are often related to a breakdown at the lemma level, where grammatical, syntactic and morphological difficulties might emerge, whereas patients with anomia tend to have to deal with difficulties related to the phonological representation of the target word, at the lexeme level (Kambanaros, 2007).

1.2. Naming Studies

Most evidence concerning selective deficits of nouns and verbs result from naming studies, which use object and action naming. Such studies have been carried out using various methodologies, materials and populations. The results of these studies have contributed to the debate of whether action naming and verbs are more demanding than object naming and nouns and why so. Recently, Maetzig and colleagues carried out a picture naming study with nine English aphasic patients and nine age-matched neurologically unimpaired comparison participants. By using the Object and Action Naming Battery which consists of a large set of well-matched items (Druks and Masterson, 2000), and apart from accuracy results, they also recorded and analyzed the latencies of the naming process of objects and actions. In this study, all patients performed faster and more accurately in naming the object than the action pictures, regardless of their clinical diagnosis, since the patient group consisted of fluent, non-fluent, and mixed aphasic patients. The same happened with the control group. The study concluded that action naming poses an increased and different type of demand on the language processor than object naming (Maetzig et al., 2007). Similar results were found in the study of Druks and colleagues (2006) comparing object and action naming in English patients with Alzheimer dementia. In comparing the performance of nineteen

patients with mild to moderate Alzheimer's disease with nineteen healthy age-matched participants, researchers found that both patients and comparison group performed faster and more accurately in naming the object than the action pictures. After a qualitative analysis of the errors researchers concluded that object and action naming probably pose different demands on the language system (Druks et al., 2006).

1.3. Object and Action Naming in Greek language

This dissociation of verbs and nouns does not appear only in English, but also in other languages with differing underlying forms, such as Chinese, Finnish, Dutch, German, Hungarian, Italian and Greek (Kambanaros, 2007). Although some studies have been carried out examining the Greek language, only few explore the naming abilities of Greek normal or speech and language disordered population, despite the fact that Greek language presents special features, interesting morphology and rich grammar. In an experimental study Bogka and colleagues (2003), investigated the naming of actions and objects by using the Object and Action naming Battery of Druks and Masterson (2000), in young English and Greek-speaking normal adult participants. The findings of this study revealed that latencies for action pictures were longer in duration than those for object pictures. The difference however, was not significant once the visual complexity of the pictures and the factor of imageability were adjusted for (Bogka et al, 2003). As Bogka and colleagues advocate, a reason for conducting their naming study in Greek was that the Greek language morphologically distinguishes between verbs and nouns. One of the problems in the comparison between English verbs and nouns in their uninflected form is that many exemplars when produced as single words are ambiguous in relation to word class. There are many verbs that have a nominal counterpart (eg comb and kiss), others, in relation to verb meaning have a related noun meaning (eg play and show) and in others the noun meaning is the name

of the action (eg walk and dance). In Greek, however, grammatical category is morphologically marked and verbs and nouns are clearly distinguishable (psarevo- to fish and psari- fish) (Bogka et al, 2003).

Modern Greek is a highly inflected language (Holton D., Mackbridge P., Philippaki-Warbuton I., 1997; Tsapkini, Jarema and Kehaya, 2002) where verbs and nouns are considered as having similar morphological, inflectional complexity (Kambanaros, 2007; Tsapkini et al., 2002). Nouns and adjectives are marked for gender, number and case, whereas verbs are marked for person, number, tense, aspect and to some extent, mood (Holton et al, 1997). Greek is a typical null subject language with relatively free word order but the unmarked order has a subject, verb, object (SVO) structure in which the verb is the central and obligatory element of the clause (Kambanaros, 2007). There are no verb infinitives (Holton et al, 1997) and it is a stem based language, with stems serving as representational units rather than actual words. For example the Greek stem *graf-* of the verb *grafo* – I write is not a possible word in Greek, it has to be inflected for tense, person, and number to become a word. Similarly, the stem *port-* of the noun *porta*-door, has no meaning unless it has its suffix *-a* attached to it. All morphemes of major lexical categories are bound and must undergo inflectional affixation in order to surface to the level of the word. Therefore the role of morphology in Greek is more pronounced and more easily detectible than in languages that are inflectionally less rich (Tsapkini et al., 2002).

With regard to the Greek verbal system, morphology appears to be quite complicated. Unlike English, Greek does not have to use subject pronouns. The ending of the verb always makes it clear whether the subject is in the first, second or third person, singular or plural. From the morphological differences in the verb endings, three persons can be identified (1st, 2nd and 3rd), and two numbers (singular and plural). In the most common and most typical clauses, the person and the number of the

verb agree with the person and the number of the subject noun phrase (Holton et al, 1997). In Greek the categories of tense and aspect are inextricably linked. Aspect indicates whether the action is presented as completed (perfective), or as progressive or repeated (imperfective). Tense is concerned with the time when an action takes place and the action is viewed as being either in the past, in the present or in the future (Holton et al, 1997). Aspect is morphologically marked in the stem of each verb, and combining the proper aspect marked stem with the suitable tense inflectional elements results in marking for tense. An additional key property of the Greek verbal system is voice. There are two groups of verb types, active voice verbs and passive voice verbs, both of which exhibit two different sets of personal endings. Verbs that present with the ending *-o* in the 1st person belong to the active voice. (eg. *den-o* – /I tie , *akou-o* /I hear, *gela-o*/I laugh) and verbs with the ending *-me* in the 1st person, belong to the passive voice (eg. *deno-me*/ I am being tied, *akougo-me*/ I am being heard, *htipie-me*/ I am being hit).

On the other hand, nominal system can also be characterized by a range of different morphological and morpho-phonological operations (Tsapkini et al., 2002). The main features of Greek nouns are gender, case, number and declensions; the system of endings that serve to indicate case and number. All nouns have an inherent gender, which could be masculine, feminine or neuter; two numbers: singular and plural and four cases: nominative, genitive, accusative and vocative. In order to be classified, nouns are based on the nominative's singular stress pattern. This classification results in oxytone nouns which are stressed on the final syllable, paroxytone nouns stressed on the penultimate syllable and proparoxytone nouns stressed on the third syllable from the end (Holton et al, 1997).

It becomes evident from the above, that both grammatical categories are dependent on their inflectional system and neither verbs nor nouns can be produced or

even processed in another way, unless they get processed and interact within the morphological level of the language processor. Word stems are bound and only when a suffix is added can they be considered proper words. It is important however, to note that in contrast to verbs, due to the number of features that nouns inflect for, the proportion of nominal inflections that a language processor has to deal with is much higher than that of verbs (Tsapkini et al., 2002). Therefore, re-examining the above evidence on differences between verbs and nouns and how the former's morphological and grammatical complexity interferes with their processing placing greater demands on them, one can hypothesize that the disproportionate number of nominal inflections cannot be accounted for the difficulty presented in verbs when considering the Greek language. Since both verbs and nouns present with complex morphology, the verbal inflectional morphology cannot be incriminated for their difficulty.

In a study by Kambanaros (2007), involving object and action naming in five Greek anomic patients and a comparison group, it was hypothesized that since noun and verb inflectional morphology is similar there would be no significant difference in the retrieval of verbs and nouns. Noun and verb comprehension and production were explored by using the Greek Object and Action Test (Kambanaros, 2003), which consisted of 60 coloured photographs of objects and actions. Comprehension was assessed with an auditory word – to – picture task, where four out of five patients, as well as the comparison group performed at ceiling showing no specific noun or verb impairments in comprehension of single words. Regarding naming, where no significant differences were expected, the findings of the study showed a significant naming difference between actions and objects, with noun retrieval being significantly better preserved than verbs in anomic patients. No effects were found at the comparison group. This contradicts the expected result of nouns being equally difficult to verbs. In an attempt to explain this, Kambanaros argues that the breakdown in the noun and verb

retrieval process for these anomia patients occurs while accessing the morpho-phonological representation of the verbs, if we suppose them to be in separate stores than nouns, or that the difficulty in accessing the morpho-phonological representations might be attributed to the semantic and syntactic complexity and information that accompanies verbs and affects their retrieval (Kambanaros, 2007).

1.4. Intransitive verbs and verbs with alternating transitivity

Even though Greek nouns and verbs have similar morphological complexity, verbs have always been the centre of researchers' attention. Verbs are not a homogeneous grammatical class. Verbs can be either transitive or intransitive, and can have one, two, or even three arguments. Studies of Thompson and colleagues (1997), Kim and Thompson (2000), Luzzatti and colleagues (2001), Lee and Thompson (2004), Jonkers and Bastiaanse (1996, 1998, 1999) and Bastiaanse and Zonneveld (2002, 2005), have shown that within the grammatical class of verbs some are more complex than others. Moreover, this complexity of verbs has a detrimental effect on agrammatic aphasics' performance. Kim and Thompson related the difficulty of agrammatic patients to the number of arguments that a verb has. The findings of these studies lead to the Argument Structure Complexity Hypothesis (ASCH) which claims that verbs with more complex argument structure, regarding number, are more difficult for agrammatic patients to produce (Lee and Thompson, 2004; Thompson, 2003). Luzzatti and colleagues (2001) in an experimental study with Italian aphasic patients also found transitive verbs being more impaired than intransitives in agrammatic aphasic patients. Differences in verb production relating to their argument structure were also found in studies of Jonkers and Bastiaanse (1996, 1998) who contradicting the theory that Broca's aphasics have problems in action naming because of the amount of grammatical information that verbs contain, claimed that the more grammatical or

thematic information the verbs carry, the easier they are to retrieve. (Jonkers and Bastiaanse, 1996, 1998).

Additional differences in verb production were found in studies relating the thematic roles of verb arguments with the performance of agrammatic aphasic patients. Within the category of intransitive verbs unaccusative ergative verbs were found to be more difficult than unergative verbs (Luzzatti, 2001; Lee and Thompson; 2004). These two different types of intransitive verbs even if they appear with the same syntactic surface structure, having one argument, just the subject of the sentence, they differ in the type of this argument. The unergative verb presents with the agent of the verb in the external argument- subject position, as in the phrase *I sleep*, whereas the unaccusative verb presents with a single argument which is internal and consists of the object which has moved in the subject position as in the phrase *I fall*. Kegl (1995) justified this difficulty of unaccusative verbs in the Syntactically Enriched Verb Entry Hypothesis (SEVEH), where she proposed that any construction lacking an external argument and involving syntactic movement of an argument at the surface structure provokes a production difficulty to agrammatic aphasic patients (Kegl, 1995). Towards the same direction is the theory of Bastiaanse and Zonneveld (2004), the Derived Order Problem Hypothesis (DOP-H). According to the DOP-H, all sentences that result from movement operations and appear differently than their basic word order will be more difficult to produce or comprehend for agrammatic aphasics (Bastiaanse and Zonneveld, 2004). Therefore, unaccusatives which occur deriving from the underlying transitive structures by movement of a theme-object to subject position, as the above theories predict, will be difficult for the Broca's aphasic patients.

Unaccusatives presented with special difficulty when comparisons were made between the two conditions of verbs with alternating transitivity (Bastiaanse and Zonneveld, 2004). Such verbs in their transitive condition behave like all other

transitive verbs; they have an agent in the subject position and a theme in the direct object position, as in the sentence *John broke the window*, where *John* is the agent of the action and at the same time the subject of the sentence, while the *window* is the theme and at the same time is the direct object of the sentence. In the intransitive version, these verbs behave as unaccusatives; the theme becomes the subject of the sentence as in *the window broke*, resulting from a movement syntactic operation where the object moved in the subject position. Findings of the investigation of alternating verbs have shown that Broca's aphasic patients have greater difficulty with the sentences involving the unaccusative- intransitive version rather than the transitive version, even if the intransitive appears to be more simple (S-V). The fact that linguistically they are more complex, as they are involved in a movement operation, render them more difficult for patients to produce (Bastiaanse and Zonneveld, 2002, 2004; Luzzatti, 2001).

However, these verbs present in exactly the same way in both transitive and intransitive conditions. The verb, despite the alteration of the sentence environment and the syntactic structure, does not change and remains identical from one condition to the other. This fact apart from languages as English and Dutch is apparent in Greek and therefore provides the opportunity of a comparison between these two conditions. Intransitive verbs can be either unergatives or unaccusatives and verbs with alternating transitivity present in the same way as in English as in the following sentences *O Giannis espase to parathuro*-*John broke the window* and *To parathuro espase*- *the window broke*. In recent literature, Katsarou and colleagues (2003) assessed the performance of the production and comprehension of verbs with alternating transitivity in Greek speaking patients with Parkinson disease and a comparison group. They examined the transitive and unaccusative verb production and comprehension with a picture description task and a picture pointing task. The findings of this study revealed

that although PD patients performed worse than comparison participants in unaccusative production, the difference was not significant. A significant difference was found in the performance of PD patients with transitive verbs being better preserved than unaccusatives. Yet, no significant effect of complexity of the verbs was found within the Greek neurologically unimpaired individuals (Katsarou, Stavrakaki, Alexiadou, Anagnostopoulou, Kafantari, Bostantjopoulou, 2003). Although the effect of transitive condition being better preserved than the unaccusative condition was evident in this study for the PD patients, still difference in the performance between PD patients and unimpaired individuals was not striking. Therefore, it appears that PD patients are not the most suitable population to show an effect regarding the unaccusative constructions. Thus, answers were pursued within the aphasic population.

In order to shed more light to the ongoing debate of verb and noun differences, as well as to examine such complex categories of verbs the present study was conducted. To contribute to the discussion of whether verbs are more difficult than nouns and why so, an object and action naming study was conducted, aiming to investigate object and action naming in aphasic patients in the Greek language. Even though several naming studies have been conducted within various populations and in various languages, there has been no study to date that implicates Greek Broca's aphasic patients with putative selective verb or noun impairments. Since Greek, discriminates morphologically nouns from verbs unlike the English language, the comparison between verb and noun performance could provide additional evidence regarding the possible underlying reasons for their differences. An attempt was also made to explore the differences in the patients' use of nouns and verbs in connected speech; and compare the availability of nouns and verbs in picture naming and connected speech.

Additionally, an effort was made to look at the performance of Broca's aphasic patients in complex categories of verbs, such as unergatives and unaccusatives as well as verbs with alternating transitivity. The two comparisons that were carried out by using a sentence completion task, aimed to, firstly, explore the difference between unergatives, with active and passive morphology and unaccusatives within the category of intransitive verbs, and secondly to compare the two conditions of verbs with alternating transitivity, the transitive and the unaccusative version. According to the previous theories, it is expected for Broca's aphasic patients, especially those showing evidence of agrammatism, to present with worse performance in unaccusative verbs rather than transitive and unergative verbs.

2. METHODOLOGY

2.1. Participants

Nine Greek Broca's aphasic patients, aged between 20 and 74 years old (mean age 56 years), four males and five females participated in this study. Their level of education ranged from 0 to 14 years (mean years of education 6.22), they all had normal or corrected to normal vision and were all right handed. They are all monolingual Greek native speakers and have lived their whole life in Greece.

Patients were recruited from a physical rehabilitation centre in Northern Greece and some of the patients who participated in the study were at the early stages of their recovery. Speech and Language Therapy reports were obtained. All the patients were diagnosed as Broca's aphasics by formal assessment using the Greek version of the Aachen Test, recently standardized in Greek population (Proios, Malatra, Christoudi, Willmes, Weniger, & Milonas, 2006) and on the basis of their spontaneous speech. CT and MRI scans were also available and the lesion sites are reported in Table 2.

Comparison data was obtained from non-brain damaged participants. Participants were matched with the patients in age and years of education. Their age ranged between 19 and 75 years old (mean age 56.1 years). Their level of education ranged from 0 to 17 years. They were five male and four female participants. They were all right handed, had normal or corrected to normal vision and were all monolingual Greek native speakers.

Table 1 gives a summary of the demographic information of the patients and the comparison group.

Table 1: demographic information about patients and comparison group

	Patients	Age	Years of education	Sex	Comparison Group	Age	Years of education	Sex
1	TT	74	2	F	C1	75	8	M
2	ED	40	14	F	C2	40	17	M
3	GA	61	10	M	C3	61	12	F
4	NG	60	6	M	C4	62	6	F
5	GM	62	0	F	C5	60	0	M
6	MX	50	12	M	C6	48	12	F
7	XL	66	0	F	C7	68	0	M
8	DS	71	0	F	C8	72	6	M
9	MC	20	12	M	C9	19	12	F
	Mean	56				56.1		

2.2. Background information about patients

The severity of patients' aphasia varied among the patient group from mild, moderate to severe aphasia. Some of the patients presented with severe apraxia of speech which made their speech even more effortful. The aetiology of brain damage in eight patients was cerebral vascular accident and in one patient traumatic brain injury. The onset of the patients' disorder varied from two to seventy two months prior to the present study. Table 2 gives a clinical summary of the patients.

Table 2: Diagnostic and background information for the aphasic patients

	Patients	Aetiology	Months since onset	Lesion site
1	TT	CVA ischemic	7	Left fronto-temporal & basal ganglia
2	ED	Haemorrhage	4	Left frontal lobe
3	GA	CVA ischemic	7	Left fronto-temporal & basal ganglia
4	NG	CVA ischemic	11	Left fronto-temporal
5	GM	CVA ischemic	4	Left fronto-temporal & basal ganglia
6	MX	CVA ischemic	72	Left fronto-temporal
7	XL	CVA ischemic	64	Left fronto-temporal & basal ganglia
8	DS	CVA ischemic	2	Left fronto-temporal & basal ganglia
9	MC	TBI	6	Left fronto-temporal & basal ganglia

2.3. Spontaneous speech

Spontaneous speech samples were collected by asking patients to talk about their lives, family, residence and jobs for a time period of fifteen minutes. They then had additional fifteen minutes to describe a set of three pictures. Patients' speech was recorded, transcribed and analyzed following the procedure suggested by Berndt, R.S., Wayland, S., Rochon, E., Saffran, E., & Sshwartz, M., (2000) and Druks and Carroll (2005). Table 3 summarizes the speech characteristics of patients, including words per minute produced, mean length of utterance (MLU), the number of words produced in their longest utterance (LU), proportion of verbs, nouns, open and closed class words.

Table 3: Patients speech characteristics

	Patients	words per minute	MLU	LU	Proportion of closed class words	Proportion of VERBS	Proportion of NOUNS
1	TT	32	3.77	8	0.51	0.20	*0.26
2	ED	41.5	3.75	8	0.40	0.22	*0.27
3	GA	15	3.45	7	0.52	0.17	*0.20
4	NG	16	2.43	4	0.41	0.21	*0.37
5	GM	37.5	4.11	14	0.53	0.17	*0.25
6	MX	5.5	1.26	4	0.04	0.08	*0.75
7	XL	22.5	2.7	6	0.50	0.16	*0.29
8	DS	14.5	3.25	4	0.45	0.20	*0.30
9	MC	22.5	2.17	6	0.45	0.02	*0.30
	Mean	23	2.98		0.42	0.18	0.33

The speech profiles of all patients in this study were compatible with the diagnosis of Broca's aphasia. In their spontaneous speech analysis, all patients presented with a higher proportion of nouns than verbs. Most patients presented with an increased proportion of open class words compared to closed class words. More specifically, TT presented with effortful non-fluent speech, consisting though of grammatical utterances and no obvious signs of agrammatism. EDs' speech was non-fluent but nearly effortless, with some agrammatic features, such grammatical-

morpheme substitutions, and reduced use of pronouns and determiners. GA, NG, MX, DS and XL presented with effortful, halting speech, full of phonological distortions which nearly lacked closed class words and sentence production. GM's speech was non fluent but nearly effortless with intense signs of perseveration but no agrammatical features. Finally, MC presented with non-fluent but effortless speech and strong morphosyntactic deficits typical of agrammatism.

Extracts of speech samples are given in the Appendix I.

2.4. An Object and Action Naming Study

2.4.1. Materials

To study the differences between object and action naming the Object and Action Naming Battery (Druks and Masterson, 2000) was used. The stimuli consist of black and white line drawings of 100 objects and 100 actions. All stimuli obtain high levels of name agreement (at least 93%) and the noun and verb items are matched pair-wise for rated age of acquisition. (Maetzig S., Druks J., Masterson J., Vigliocco G., 2007).

In this study the Greek version of the Object and Action Naming Battery was used provided by the study of Bogka et al (2003). The stimuli were a subset of the original naming battery consisting of pictures of 60 objects and 60 actions. The reason for using a subset rather than the whole battery was because the names of some of the Druks and Masterson (2000) pictures do not translate to a single word in Greek or because no verbal label is available (Bogka et al., 2003). They were selected following the collection of Greek name agreement data from 32 adult participants who spoke Greek as their first and main language and pictures that did not produce a single verbal label or those that obtained less than 93% name agreement were discarded. Age of acquisition ratings for the verbal labels as well as imageability ratings were also collected by Greek speakers (Bogka et al., 2003). Item characteristics of the stimuli are reported in Table 4 and a list of stimuli can be found in the Appendix II.

Table 4: Item characteristics of the action and object pictures and their verbal labels in the Greek version of the OAB (Bogka et al., 2003)

	Actions				Objects			
	Age of acquisition	Visual complexity	Imageability	Length (in phonemes)	Age of acquisition	Visual complexity	Imageability	Length (in phonemes)
Later acquired (n=26)	4.05 (0.73)	4.47 (0.80)	4.02 (0.72)	6.19 (1.67)	3.75 (0.56)	3.36 (1.53)	5.30 (0.73)	6.31 (1.52)
Early acquired (n=34)	2.74 (0.45)	4.13 (0.72)	4.41 (0.66)	5.80 (1.55)	2.70 (0.52)	3.20 (1.09)	5.76 (0.41)	5.80 (1.26)

The experiment was conducted on a Sony Vaio Laptop computer and the pictures were presented on the screen by using the experimental package PsyScope (Cohen, Mac Whinney, Flatt, & Provost, 1993) Responses were recorded continuously with SoundEdit audio recording software (version 2.0, 7 Felt Tip Software, Kwok, 2002). Latencies were calculated from the spectrogram from the time the picture appeared on the screen until the onset of the correct target response. Use of the SoundEdit allowed for the recording of precise latencies for correct responses, even when the participants produced pre-response vocalizations and other false starts, including self corrected incorrect responses (Maetzig et al., 2007).

2.4.2. Procedure

Participants were asked to name aloud 60 object and 60 action pictures as quickly and clearly as possible, using a single word. Twelve action pictures and twelve object pictures, not included in the experimental items were used as practice blocks in order to train the patients to name the picture according to what it was asked and were presented before each experimental session. Items were organized and presented in blocks of fifteen items and their presentation during the test was done randomly. Items within the blocks were presented in a predetermined random order. Before the beginning of each block, patients were informed which picture type they would see by answering in case of action naming the question “something is happening in the pictures and I want you to tell me what is happening” or “someone is doing something in the pictures and I want you to tell me what he/she is doing”. Therefore, participants were asked to name the action using the third person singular form. For the impersonal actions (such as *raining* and *snowing*), the third person form was once again used. Regarding object naming participants were asked to name the pictures after the question “You will see something appearing on the screen and I want you to tell me what it is”. The presentation began after the experimenter pushed the button, and throughout the whole session he was the one controlling the procedure by pushing the buttons. The experimenter moved to another item as soon as the participant gave a response, or after a period of approximately 30 seconds had elapsed. Sometimes patients were given a prompt reminding them that they were looking for a verb or a noun by asking them “what is he doing?” or “what is this” in case of actions and objects respectively. Patients were offered a rest period between the blocks. However, not all patients (GA, NG, GM, MX, DS, and MC) were able to complete the test in one session, and therefore the procedure was repeated twice.

2.4.3. Results

Latency analysis

Not all data entered the latency analysis. Included in the latency analysis were target responses with recognizable phonological (*tafilia* for *stafilia*) or morphological distortions (*pulia* for *puli*) and multiword responses including the target word (*ta paputsia tu deni* for *deni*). Excluded from the analysis were acceptable synonyms and responses that were provided following a prompt. The naming of the patient group was very slow and much data had to be discarded for the previously mentioned reasons, leaving a very small number of acceptable responses for latency analysis. This is why it was decided that latency analysis would be carried out only for the comparison group and not for the patients group. From the comparison group latency analysis 3.54% representing the acceptable synonyms, 0.6% prompted responses and 1.8% latencies exceeding two standard deviations above each participants own mean latency were discarded. Finally, 0.56% of the sum of the data was discarded due to technical problems. Table 5 gives mean naming latencies of the comparison group in msec.

Table 5: mean naming latencies of patients and comparison group in msec (SD in brackets)

Patients	C1	C2	C3	C4	C5	C6	C7	C8	C9	Comparisons Group mean latency
Objects	1621	886	1348	1292	1202	1109	2321	2045	887	1412 (497)
Actions	1501	917	1389	2349	1238	1507	6083	3698	1098	2198 (1687)

In order to explore differences in mean latencies of object and action naming within the comparison group, a paired sample t-test was carried out. The t-test [$t(8) = 1.872, p = 0.098$] showed that the difference between the mean latency of object naming and action naming of the comparison group was not significant. However, all participants, apart from one, C1, who named actions faster than objects, were faster in naming objects than actions.

Error analysis

The number of errors made in response to object and action pictures by individual patients and comparison group are presented in Table 6

Table 6: number of errors in object and action naming made by the patients and comparison group

Patients	TT	ED	GA	NG	GM	MX	XL	DS	MC	Patients total	Controls total
Objects	17	3	38	22	28	36	36	38	34	252	32
Actions	19	6	42	40	41	45	42	47	31	313	57

In order to explore the differences of error scores among the patients group and the comparison group three a priori paired sampled t-tests were carried out. A comparison was made between the number of errors made on actions versus objects in each group. Findings revealed that there was a significant effect of picture type in the patients group [$t(8)=3.238$, $p=0.012$] and that patients made significantly more errors in naming actions than objects. Nevertheless, this did not seem to be significant for the comparison group where the effect of picture type was not significant [$t(8)=1.821$, $p=0.106$] and therefore there was no significant difference in errors elicited in response to object pictures than in action pictures within the comparison group. The third t-test explored the score difference of object and action naming between the two groups. The comparison showed that the difference on scores between the two groups was not significant [$t(8)= 1.503$, $p=.171$].

In order to investigate the performance of each patient in the naming of objects and actions, a χ^2 calculation was made for each one individually. Nearly all patients, except MC, made more errors in action than in object naming. MC made more errors in naming objects than actions but the difference was not significant ($\chi^2(1) = [0.302]$, $p=$

0.583). Even if overall, most patients made more errors in action naming than in object naming,, the difference between number of errors produced by actions than the number of errors produced by objects was significant only for two patients, NG ($\chi^2 (1) = [11.552]$, $p= 0.001$), and GM ($\chi^2 (1) = [7.009]$, $p= 0.008$) who both made a significantly higher number of errors in naming actions than objects.

Qualitative analysis of errors

Apart from investigating the latencies and the accuracy with which the pictures were named, an analysis of the types of errors that patients and comparison group made was carried out. For this error analysis a pre-specified classification scheme distinguishing between semantic type errors, visual type errors and “other” errors, was used. Among the semantic errors, co-ordinate, super-ordinate, sub-ordinate and associative errors were included. Visual errors consisted of frank visual errors and errors involving a misinterpretation of the intentions of the picture, meaning a visual type error in which an unintended part of the picture was named or necessary inferences of semantic nature were not made. Among “other” errors omissions, unrelated errors, circumlocutions and mixed errors, involving morphological and phonological distortions, were included. (Druks et al, 2006, Maetzig et al., 2007). Table 7 gives examples of errors for actions and objects made by the patient group

Table 7: examples of errors of actions and objects made by the patients

ERROR TYPE		Examples of errors	
		ACTIONS	OBJECTS
SEMANTIC	CO-ORDINATE	Walking → running	Axe → hammer
	SUPER-ORDINATE	-	Cow → animal
	SUBORDINATE	-	Circle → ball
	ASSOCIATIVE	Drawing → brush	Candle → fire
VISUAL	FRANK VISUAL	Eating → wears his teeth	Button → dice
	MISINTERPRETATION OF PICTURE	Stroking → sits	Saddle → horse
OTHER	CIRCUMLOCUTION	Praying → he kisses the cross and says dear Holy Mary	Tent → go for camping, stay in it
	UNRELATED	Knitting → she is seing something	Shirt → ashtray
	NO RESPONSE-OMISSIONS	-	-
	MIXED	Painting → being painted	Elephant → dear (in Greek start with the same syllable)

Tables 8 and 9 report the number and percentage of errors, classified according to the above categories, made by the patient and the comparison group

Table 8 : Number of errors and percentage error, according to error type, for the patient group

ERROR TYPE		ACTIONS		OBJECTS	
		Number	Percentage	Number	Percentage
SEMANTIC	CO-ORDINATE	15	4.79%	26	10.31%
	SUPER-ORDINATE	0		6	2.38%
	SUBORDINATE	0		12	4.76%
	ASSOCIATIVE	53	16.93%	26	10.31%
VISUAL	FRANK VISUAL	15	4.79%	13	5.15%
	MISINTERPRETATION OF PICTURE	15	4.79%	2	0.79%
OTHER	CIRCUMLOCUTION	47	15.01%	12	4.76%
	UNRELATED	30	9.58%	12	4.76%
	NO RESPONSE-OMISSIONS	81	25.87%	92	36.50%
	MIXED	57	18.21%	51	20.23%
TOTAL		313		252	

Table 9: Number of errors and percentage error, according to error type, for the comparison group

ERROR TYPE		ACTIONS		OBJECTS	
		Number	Percentage	Number	Percentage
SEMANTIC	CO-ORDINATE	10	17.85%	5	15.62%
	SUPER-ORDINATE	1	1.75%	4	12.5%
	SUBORDINATE	0	0	0	0
	ASSOCIATIVE	5	8.77%	4	12.5%
VISUAL	FRANK VISUAL	22	38.6%	10	31.25%
	MISINTERPRETATION OF PICTURE	5	8.77%	2	6.25%
OTHER	CIRCUMLOCUTION	10	17.85%	0	0
	UNRELATED	1	1.75%	0	0
	NO RESPONSE-OMISSIONS	2	3.5%	5	15.62%
	MIXED	1	1.75%	2	6.25%
TOTAL		57		32	

The examination of the errors, analysed on the basis of the above categories resulted in some interesting findings. The patients made more errors in response to

actions than objects in almost all error categories. In the patients group most errors were omissions type errors followed by mixed type errors for both objects and actions. A large number of circumlocutions and associative errors was evident in response to actions for the patient group. The error types in the comparison group presented a totally different picture. Most errors were made again in response to actions, yet they were mostly of visual type, followed by circumlocutions and co-ordinate errors. Not a large number of omission type errors was evident in the comparison group.

2.5. Verbs with alternating transitivity, a sentence completion task

In the second part of this study, the availability and production of verbs with alternating transitivity and intransitive verbs in Greek language was examined by using a sentence completion task.

2.5.1. Materials

As the verbs with alternating transitivity are verbs with two distinct syntactic realizations, one transitive and one unaccusative form, as in the sentence *O Giannis espase to parathuro*-John broke the window and *To parathuro espase*- the window broke, the sentence completion task aimed to compare the availability of the same verb in the two different syntactic environments. Sixteen verbs were selected and sixteen pairs of sentences were formed, one using the transitive form and one using the unaccusative form of the verb. Table 5 lists the verbs used in the task. Each sentence consisted of a lead in sentence which provided a context for the sentence to be completed and a second where the target verb was missing. All sentences were of comparable length and the same structure, with the verb roughly in the same position near the end of the sentence. In each pair of sentences the target verbs were identical in person, number and tense regardless of the sentence environment, as in the following example of the unaccusative version of the verb *svino*-switch off “*Ksafnika egine diakopi reumatosis. Sto diamerisma ola ta fota esvisan*- Suddenly there was a power-cut. *In the apartment all lights switched off”*. and the transitive version of the same verb “*Itan ke oi dio poli kurasmeni. Ipan kalinixta, epesan sto krevati ke esvisan ta fota*. – *They were both very tired. They said goodnight, got into bed and switched off the lights”*. Prior to presenting the sentences to the patients they were administered to five neurologically unimpaired individuals, to ensure that the sentences would elicit the target verb.

Table 10: ergative verbs used in the sentence completion task

	Greek	Greek phonological equivalent	English translation
1	Σβήνω	Svino	Switch off
2	Στεγνώνω	Stegnono	Dry
3	Βράζω	Brazo	Boil
4	Σπάω	Spao	Break
5	Χαλάω	Xalao	Ruin
6	Αδειάζω	Adiazo	Empty
7	Γεμίζω	Gemizo	Fill
8	Λιώνω	Liono	Melt
9	Μυρίζω	Mirizo	Smell
10	Χτυπάω	Xtupao	Hit
11	Σταματάω	Stamatao	Stop
12	Σκάω	Skao	Burst
13	Πετάω	Petao	Fly/through
14	Ανοίγω	Anigo	Open
15	Ανάβω	Anavo	Light/switch on
16	Κλείνω	Klino	Close

2.5.2. Procedure

Participants were asked to fill in the sentence with the appropriate verb. The examiner spoke out the sentence once with the gap. The second time he spoke out the sentence the patients completed the sentence by telling the missing verb. It is important to note that in verbs with alternating transitivity sentence completion task, pairs were divided into two separate blocks, one of transitive verb sentences and one of unaccusative verb sentences each consisting of 16 stimuli. These blocks were presented to the patients separately in a random order. If patients weren't able to complete the sentence with the appropriate verb phonological cueing was provided. Patients' answers were recorded, transcribed and analyzed by the examiner.

2.5.3. Results

In the investigation of the performance of the verbs with alternating transitivity, eight out of nine patients participated. Table 10 reports the number and percentage of correct responses of each patient in the sentence completion task.

Table 11: Correct responses in the sentence completion task of verbs with alternating transitivity

Patients	TT	ED	GA	NG	GM	MX	XL	DS	MC	Total (n=128)	percentage
Unaccusatives (n=16)	12	15	3	10	16	-	7	8	4	75	58.6%
Transitives (n=16)	8	13	5	4	10	-	5	6	8	59	46.1%

In order to explore the differences in the performance between the two conditions of the verbs, unaccusative and transitive, a paired sampled t-test was carried out. A comparison was made between the numbers of correct responses given in response to the unaccusative versus the transitive condition. Findings revealed that there was no significant difference between the two conditions [$t(7)=0.351$, $p=0.736$] and that the majority of patients scored better in unaccusative condition than in transitive. Only two patients (GA and MC) showed the opposite effect of transitive verbs resulting in more correct responses than the unaccusatives.

2.6. Intransitive Verbs, a sentence completion task

2.6.1. Materials

In the second sentence completion task the availability of two types of intransitive verbs was explored. In this task twenty-one intransitive verbs were used. Among them, fourteen were unergatives, seven of active morphology, seven of passive morphology, and seven were unaccusatives. Each sentence consisted of a lead in sentence which provided a context for the sentence to be completed and a second where the target verb was missing. All sentences had approximately the same length and the same structure, with the verb roughly in the same position near the end of the sentence. Table 11 gives the verbs used in the task and a list of all stimuli can be found in the Appendix III. Again, all sentences were tested for their accuracy and validity among normal participants prior to being administered to the patients.

Table 12: intransitive verbs used in the sentence completion task

	Greek	Greek phonological equivalent	English translation	
1	Αιμορραγώ	Aimorragw	Bleed	Unaccusatives
2	Ανθίζω	Anthizw	Blossom	
3	Επιπλέω	Epiplew	Float	
4	Ιδρώνω	Idrwnw	Sweat	
5	Λάμπω	Lampw	Shine	
6	Πεινάω	Peinaw	Be hungry	
7	Τρέμω	Tremw	Tremble	
1	Αντιδράω	Antidraw	React	Unergatives with active morphology
2	Δραπετεύω	Drapeteuw	Break free	
3	Φεύγω	Feugw	Leave	
4	Κελαιδάω	Kelaidw	Bird-sing	
5	Μιλάω	Milaw	Talk	
6	Μπáινω	Mpainw	Enter	
7	Ροχαλίζω	Roxalizw	Snore	
1	Αγωνίζομαι	Agwnizomai	Struggle	Unergatives with passive Morphology
2	Έρχομαι	Erxomai	Come	
3	Φτερνίζομαι	Fternizomai	Sneeze	
4	Κοιμάμαι	Koimamai	Sleep	
5	Παραιτούμαι	Paraitoumai	Quit	
6	Συνεργάζομαι	sunergazomai	Co-work	
7	Κάθομαι	Kathomai	Sit	

2.6.2. Procedure

The same procedure was followed for the second task of intransitive verbs. The examiner spoke out the sentence once with the gap and when the sentence was heard for the second time the patients completed the sentence by telling the missing verb. If patients weren't able to complete the sentence with the appropriate verb phonological cueing was provided. Patients' answers were recorded, transcribed and analyzed by the examiner.

2.6.3. Results

Regarding the comparison between the intransitive verbs seven out of nine patients participated. Table 12 reports the number and percentage of correct responses of each patient in the sentence completion task.

Table 13: Correct responses in the sentence completion task of intransitive verbs

Patients	TT	ED	GA	NG	GM	MX	XL	DS	MC	Total (n=49)	percentage
Unaccusatives (n=7)	-	4	2	2	2	-	0	2	3	15	30.6%
Unergatives (active morphology) (n=7)	-	5	2	3	5	-	3	2	3	23	46.9%
Unergatives (passive morphology) (n=7)	-	3	0	2	3	-	5	3	3	19	38.8%

To explore the differences between them three paired samples t-tests were carried out. No significant difference was found between the three verb categories unaccusatives versus unergatives with active morphology [$t(6)=2.248$, $p=0.066$], unaccusatives versus unergatives with passive morphology [$t(6)= -1.263$, $p=0.253$], or between the two unergative verb categories with active and passive morphology [$t(6)= -0.253$, $p=0.808$]. Yet, unaccusatives elicited less correct responses than both categories of unergative verbs overall and nearly for most patients.

3. DISCUSSION

3.1. Discussion of naming study

It appears that actions were more difficult to name since most of the comparison participants (8/9) were slower in naming the action than the object pictures. This finding was consistent with the findings of previous studies that had taken into consideration the difference in naming latencies and had used the same materials. Such studies as for example, Maetzig et al (2007), Druks et al (2006), as well as Bogka et al (2007), have all found that neurologically unimpaired young and elderly participants were slower at naming actions than objects. When a comparison was made between the latencies of comparison groups in the above studies it was found that age is an important factor influencing latency in naming. Greek young adults (Bogka et al., 2003) named faster, both objects and actions than Greek elderly adults in the present study. Similar findings emerged from the equivalent comparison of English young adults (Bogka et al., 2003) and English elderly adults (Maetzig et al., 2007). Moreover, when latencies were compared in naming among the same age group and while comparing the latencies in the two languages, it became evident that in both age groups, young and elderly adults, Greek language exhibits larger latencies than English language in naming, possibly due to the fact that in Greek both verbs and nouns need to be inflected and this is a process which makes naming in Greek longer than in English.

The patient group made more errors overall than the comparison group. Action naming elicited more errors than object naming for both groups, but the difference was not significant for the comparison group. As it has been expected, the comparison group treated objects and actions approximately the same, without any significant difference in accuracy of the two picture types. This finding was consistent with other studies of object and action naming in neurologically unimpaired individuals. In both studies, Druks et al (2006) and Maetzig et al (2007), comparison groups made fewer

errors in object than in action naming. However, this did not seem to apply for the Greek naming study of Kambanaros (2007) where the comparison group performed at ceiling for both tasks. It is important to note though, that Kambanaros used different materials and procedure than the Druks et al (2006), the Maetzig et al.(2007), as well as the present study. The verbs used in the study of Kambanaros were all transitive verbs of active morphology. In contrast, the OAB in Greek included different types of verbs (transitive, intransitive, active and passive). The difference in the verbs used in the Kambanaros study and the OAB could account for the different accuracy performance in Greek comparison participants. Since the Kambanaros' study does not provide a list of the material, one can hypothesize that the verbs used were easier than the ones used in the OAB.

As far as the patient group accuracy outcomes are concerned, results were consistent with the current literature that presents Broca's aphasic patients to be more impaired in action naming than in object naming (Caramazza & Hillis, 1991; Hillis and Caramazza, 1995; Miceli, Silveri, Noncentini & Caramazza, 1988); a finding also consistent with the findings of Nanousi et al.(2006) to the extent that actions are more impaired than objects in Greek Broca's aphasic patients. But even if Broca's aphasics tend to be more verb impaired, in the present study only two patients were significantly more impaired in verbs than in nouns. Results of the present study reflect the general picture discussed in Maetzig et al. (2007), that there are many more verb impaired patients but the majority of them shows only a small difference in their performance of nouns and verbs (Maetzig et al., 2007).

While examining the errors it became obvious that the two grammatical categories elicited different kinds of errors in patient and in the comparison group. The patients made more errors in response to actions rather than objects in almost all error categories apart from the coordinate errors and the omission errors. With regard to

semantic errors, approximately the same number in response to actions and objects was elicited but it was differently spread. Actions elicited a larger number of associative errors, whereas objects had a greater variation in the semantic error category, including many more co-ordinate and associative and less superordinate and subordinate errors. This could be possibly attributed to the semantic organization of nouns which is more hierarchical than that of verbs and sharing many more common features among the exemplars of each semantic category. Therefore co-ordinate errors, associations, and substitutions among the various semantic categories of objects are more likely to occur. Similar pattern was found at the comparison group, which, even so, presented with a higher number of co-ordinate errors than associative errors in both action and object naming.

Patients made more errors in all error categories than the comparison group in both object and action naming with the exception of visual errors that were more in the comparison group. The comparison group presented with a disproportionate number of frank visual errors for actions than for objects implying that action pictures are more complex than object pictures. In patients' group actions elicited more misinterpretation of the picture errors than objects. This could have been expected because pictures of actions involve a larger number of elements related one with the other leading to possible misinterpretations.

What is more important however in this error analysis is the large number of omission errors produced by the patient group in response to both actions and objects, contrastingly to the comparison group that presented with just a few. The fact that some patients displayed a large number of omission errors might be related to the severe apraxia of speech that coexisted with their aphasia. Their apraxia might have interfered with their performance in naming resulting to either not recognizable phonological distortions included in the mixed errors, or in potential omissions. These omission

errors resulting from apraxia may be able to justify the large number of object errors, but still cannot account for the disproportionate verb deficit. With respect to Levelt's model of language processing and word retrieval (Levelt, 1989, Levelt et al., 1990, 1999) the large number of omissions could be a result of a breakdown either at the level of accessing the representations or at the representations themselves. However, the fact that when patients received a phonological cue they were able to say the word revealed that the morphophonological representation was there but not able to be accessed.

In the analysis of errors it became evident that some errors were more common than others and that some items, both object and action pictures, elicited more, and even specific errors. It is necessary to point out that when the Greek version of the Object and Action Battery, was formulated, young adults were the participants of the study (Bogka et al, 2003). It is obvious that the large age difference, as well as the diverse background of the participants with which the two studies present leads to the presence of some unsuitable items for the present study. A particular example involves a picture of an English type plug which is barely recognizable from elderly adults who have lived all their lives in a city of Northern Greece. Apart from some items being inappropriate for the particular population, there were some items which had more than one possible verbal label; this fact sometimes obstructed the scoring procedure. Finally, some items were more error prone than others eliciting visual errors, or misinterpretation of the picture errors; this could be possibly attributed to the visual complexity of the item itself, since some pictures are more complex and less clear than others. Error prone items regardless the error type elicited as well as the items eliciting most visual and misinterpretation of the picture errors are listed in Appendix IV. However, all the above items were chosen not to be removed from the study since name agreement and imageability ratings were obtained for Greek language and were considered as carefully matched (Bogka et al., 2003).

3.2. Discussion of the verb study

In the comparison between unaccusative and unergative verbs, the findings, although not statistically significant, are consistent with the findings of studies of Lee and Thompson (2004), Thompson (2003) and Kegl (1995), which support that unaccusatives will be more difficult than unergatives due to the movement required for their formulation. However, this does not seem to apply for the verbs with alternating transitivity. As findings of the previous studies claim, the transitive condition of the verbs with alternating transitivity has been found easier to produce and to construct a sentence with than the unaccusative condition of the same verb. Nonetheless, in this study results appear to go towards the opposite direction, with unaccusative verbs easier to produce than transitives. Even if the difference between these two conditions was not significant, six out of eight patients performed better in the unaccusative sentences than the transitives. Movement operations do not seem to obstruct the production of the unaccusatives. However, this might be attributed to the nature of the task that elicits the verb; in the sentence completion task the context is already provided and patients do not need to construct the whole sentence. In the task used by Bastiaanse and Zonneveld (2005), patients had to construct a sentence that described the picture shown, by using the verb given in the infinite form. The whole constructing procedure might have been the key point for the different findings between the two studies; in the task of Bastiaanse and Zonneveld, the lexical context was already given but patients still needed to perform the movement operation to construct the sentence. Even in Kegl's study, difficulty with unaccusatives surface during spontaneous speech, where, again, there was a construction process. On the other hand, in the sentence completion task, the construction is already provided, the semantic context is there, and the only part missing is the lexical retrieval of the missing verb. And even in the comparison of unaccusative versus unergative sentence completion task, unaccusatives were not

totally erroneous; they were just worse performed than the unergatives. The difficulty therefore that the agrammatic patients have with unaccusatives possibly lies in the construction of the sentence and not in retrieving the unaccusative verb.

Still, even if a putative explanation exists for the performance of unaccusatives, the question is why these are weaker than unaccusatives. The explanation might lie within Kim and Thompson's Argument Structure Complexity Hypothesis. Indeed these verbs because of their two-place argument structure may pose greater difficulty to the aphasic patients. Additionally, practical reasons related to the task might interfere with the performance of patients in transitive verbs. The position of the object, placed after the gap in the sentence completion task, appears to complicate the production of the verb. Even so, a notable effect became evident in this comparison of these various complex verb categories. Indeed patients who showed agrammatic features in their speech, such as ED, MC presented in this sentence completion task with various morphological errors, mostly related to passive morphology. These errors included substitutions of passive morphology inflections with active morphology inflections. Other errors made in these tasks were of semantic nature, where patients weren't able to understand the meaning of the sentence or errors made due to the task itself. It is also important to note that patients were able to produce verbs more easily than in the naming study or their spontaneous speech, since they were facilitated by the semantic cue and the prosody and intonation pattern provided by the sentence.

4. CONCLUSIONS

This study's objective was to contribute to the discussion of whether verbs are more difficult than nouns and why so, in the Greek language and specifically in Greek Broca's aphasic patients, by assessing their naming ability in response to objects and actions. Furthermore, in the second part where the various verb categories were investigated, claims were made of whether different verb categories such as unaccusatives are more difficult, in Greek language, as it has been found in previous studies for other languages. It appears that due to the morphological characteristics that Greek language presents with, it provided a fertile ground for research in object and action naming as well as in the various verb categories.

The findings of this study seem to be in accordance with the general picture of the current literature concerning the difference in performance of nouns and verbs in aphasic patients as well as in neurologically unimpaired individuals. Action naming seems to be more difficult than object naming in Greek Broca's aphasic patients as well as in neurologically unimpaired individuals despite the fact that in Greek language nouns and verbs present with similar morphological complexity. Differences observed in the performance of object and action naming, as well as the variation in error types elicited in response to object and action naming show that each one grammatical category interferes in a different way with the language process. However findings emerging from the study of verbs with alternating transitivity and intransitive constructions present with some alterations regarding recent literature. The reasons for these different findings should be further pursued in the methodology of assessing the unaccusative constructions.

(WORD COUNT: 10217)

References

- Bastiaanse R. and Zonneveld R., (2002) *The production of verbs with alternating transitivity in Broca's and anomic/Wernicke's aphasia*. Brain and Language, 83, 76-78
- Bastiaanse R. and Zonneveld R., (2005) *Sentence production with verbs with alternating transitivity in agrammatic Broca's aphasics*. Journal of Neurolinguistics, 18, 57-66.
- Berndt, R.S., Wayland, S., Rochon, E., Saffran, E., & Sshwartz, M., (2000). *Quantitative production analysis. A training manual for the analysis of aphasic sentence production*. Hove: Psychology Press
- Bird H., Howard D., and Franklin S.,(2003) *Verbs and Nouns : the importance of being imageable* Journal of Neurolinguistics, 16, 113-149.
- Bogka N., Masterson J., Druks J., Fragkioudaki M. and Chatziprokopiou E., (2003) *Object and action picture naming in English and Greek*. European Journal of Cognitive Psychology 15: 371-403
- Caramazza A. and Hillis A., (1991) *Lexical organization of nouns and verbs in the brain*. Nature, 349, 788-790
- Druks, J., & Masterson, J. (2000) *An Object and Action Naming Battery*. Hove: Psychology Press.
- Druks, J., (2002) *Verbs and Nouns – A review of the literature*. Journal of Neurolinguistics, 15, 289-315.
- Druks J. and Carroll E. (2005) *The crucial role of tense for verb production*. Brain and Language, 94, 1-18.

- Druks, J., Masterson, J., Kopelman, M., Clare, L., Rose, A., and Rai, G. (2006) *Is action naming better preserved than object naming in Alzheimer's disease and why should we ask?* Brain and Language, 98, 332-340
- Gentner D., (1981). *Some interesting differences between verbs and nouns.* Cognition and Brain Theory, 4, 161-177
- Gentner D., (1982). *Why nouns are learnt before verbs: Linguistic relativity versus natural partitioning.* In Kuczaj (Ed.) Language Development. Hillsdale, NJ: Earlbaum.
- Hillis A. and Caramazza A., (1995) *Representations of grammatical categories of words in the brain.* Journal of Cognitive Neuroscience, 7, 396-407
- Hirsh – Pasek, K. and Golinkoff, R.M. (Eds) (2006) *Action meets word: How children learn verbs.* New York: Oxford University Press.
- Holton D., Mackbridge P., Philippaki-Warburton I., 1997, *Greek. A Comprehensive Grammar of the Modern Language*, Routledge ed., New York
- Huttenlocher J and Lui F. (1979) *The semantic organization of some simple nouns and verbs.* Journal of verbal learning and verbal behaviour, 18, 141-162
- Jonkers, R. and Bastiaanse, R. (1996) *The influence of instrumentality and transitivity on action naming in Broca's and anomic aphasia.* Brain and Language, 55, 37-39.
- Jonkers R. and Bastiaanse, J. (1998) *Case Study. How selective are selective word class deficits? Two case studies of action and object naming.* Aphasiology, 12, 245-256.
- Kambanaros M., (2007) *The trouble with nouns and verbs in Greek fluent aphasia.* Journal of Communication Disorders, doi: 10.1016/j.jcomdis.2007.02.01
- Katsarou Z., Stavrakaki S., Alexiadou A., Anagnostopoulou E., Kafantari A., Bostantjopoulou S., (2003) *Verbs with alternating transitivity in Parkinson's*

- disease: Evidence from production and comprehension tasks.* Brain and Language, 87, 63-64.
- Kegl, J. (1995) *Levels of representation and units of access relevant to agrammatism.* Brain and Language, 50, 151-200.
 - Kim, M. and Thompson, C.K., (2000) *Patterns of Comprehension and Production of Nouns and Verbs in Agrammatism: Implications for Lexical Organization.* Brain and Language, 74, 1-25
 - Lee, M. and Thompson, C.K. (2004) *Agrammatic aphasic production and comprehension of unaccusative verbs in sentence contexts.* Journal of Neurolinguistics, 17, 315-330
 - Levelt W.J.M. (1989) *Speaking: from intention to articulation* Cambridge, MA: MIT Press
 - Levelt W.J.M. (1992) *Lexical Access In Speech Production*, Blackwell
 - Levelt W.J.M., Roelofs A., Meyer A.S., (1999) *A theory of lexical access in speech production.* Behavioural and Brain Sciences, 22, 1-75.
 - Luzzatti C., Raggi R., Zonca G., Pistarini C, Contardi A., Pinna G, (2001) *On the nature of the selective impairment of verb and noun retrieval.* Cortex, 37, 724-726
 - Matzig, S. and Druks, J. (2006). *Object vs. action naming: A double dissociation?* Brain and Language 99, 219
 - Maetzig S., Druks J., Masterson J., Vigliocco G., *Object vs. action naming: A double dissociation?*(submitted)
 - McCarthy R. and Warrington EK, (1985) *Category specificity in an agrammatic patient: the relative impairment of verb retrieval and comprehension.* Neuropsychologia, 23, 709-727

- Miceli G., Silveri MC, Villa G., and Caramazza A. (1984) *On the basis of the agrammatic's difficulty in producing main verbs*. Cortex, 20, 207-220.
- Miceli G., Silveri MC, Noncentini U. and Caramazza A, (1988) *Patterns of dissociation in comprehension and production of nouns and verbs*. Aphasiology, 2, 351-358.
- Nanousi V., Masterson J., Druks J., Atkinson M. (2006) *Interpretable vs. Uninterpretable features : Evidence from six Greek-speaking agrammatic patients*. Journal of neurolinguistics, 19, 209-238.
- Proios, H., Malatra, I., Christoudi, C., Willmes, K., Weniger, D., & Milonas, I. (2006). *Development and validation of the Aachen Aphasia Test in the Hellenic Language*, International Neuropsychology Society Meeting "From Plasticity to Rehabilitation" INS/SVNP/GNP, July 2006.
- Thompson, C.K., Lange K.L., Schneider S.L., Shapiro L.P., (1997) *Agrammatic and non-brain-damaged subject's verb and verb argument structure production*. Aphasiology, 11, 473-490.
- Thompson, C.K. (2003) *Unaccusative verb production in agrammatic aphasia: the argument structure complexity hypothesis*. Journal of Neurolinguistics 16, 151-167.
- Tsapkini K., Jarema, G., Kehaya, E. (2002) *A morphological processing deficit in verbs but not in nouns: a case study in a highly inflected language*. Journal of Neurolinguistics , 15, 265-288.
- Vigliocco, G., Warren, J., Arcuili, J., Siri, S., Scott, S., Wise, R. (2006) *The role of semantics and grammatical class in the neural representation of words*. Cerebral Cortex
- Zingeser LB. and Berndt RS., (1990) *Retrieval of nouns and verbs in agrammatism and anomia*. Brain and Language, 39, 14-32

Appendix 1

Extracts of patients' spontaneous speech

TT

Gr: o...apo pano tha arxiso...vlepo...vlepo ton aporofitira...vlepo ti gineka kati na magirevi...ti magirevi pano stin kuzina den to ksero...exi gineka tin podia tu san ke mena. Ke olo ti deni apo piso...ine nikokurula...hehehe (laughs) Vlepo luludia...to dulapi...to parathiro...to dulapi...blepo dio vrises...vlepo to ekino pu tha plene ta piata ke mia gineka pleni ta piata.

En: o...from above I will start...i see...I see the cooker-hoo... I see the woman cooking something...what she is cooking I do not know...has woman her apron like me. And she ties her in the back...she is a housewife...heheheh (laughs) ...I see flowers...the cupboard...the window...the cupboard...I see two taps...I see the thing where will wash the dishes and a woman washes the dishes.

ED

Gr: ine ikogenia. Enas andras ke mia gineka. I gineka magirevi ke o adras...pleni ta piata. To trave-trapezi exi ena psari megalo. Pios tha to fai afto? Mmm...exun trapezi gia dio...tris...ine i mama...o babas...o babas ana-ana-anavi ta keria ke i mama perimeni na katsi. Ine stromeno to trapezi. Pota...krasia...potiria...ke to fai...exi ke tzaki mesa...potiria pano sto trapezi...ine étimo.

En: its a family. A man and a woman. The woman cooks kai the man...washes the dishes. The tab-tab-table has one fish big. Who is going to eat it? MMM...they have table for two...three...its mom...dad...dad li-li-lights the candles and mom waits to seat. Table is leaned... Drinks...wines...glasses...and food...it has a fireplace in...glasses on the table...it is ready.

GA

Gr: enas orthios...ena psari...enas...vazi...vazi sta xeria to...de fturai to...ax...den boro na to po...to ladi tha riksi mesa ke ferni...pola piata...den ksero...den ksero...trapezi... to trapezi...na ke ta piata...na ke to psari pu ine edo ke afta edo.

En: a standing person...a fish...a...puts...puts on hands the... it doesn't _____ the ...ax...I cant say it...the oil he will put in and brings...many dishes... don't

know... don't know ...table...the table...here are the dishes...here is the fish which is here and these here.

NG

Gr: e...e...e...a...e...tora...kala...eki...e...GUUUUUU (makes sound)
ke...tire...ke...e... ki ena ...pleni piata. Ke afti ...pleni...ke afti . e...afto kato
edo...ke ...fufufufufuf (makes sound)...e gamoto...ma- ma- magirevi...kudi-
kuzina...grivadi...fagito eki...na pane kanonika...na fane... ke na fane...

En: e...e...e...a...e...now...well...there...e...GUUUUUU (makes sound) and ...*tire*
(neologism) and...e...and one... washes dishes. And she...washes...and she...e...this
down here...and fufufufufufu(makes sound) damit...coo-coo-cooks...ki-
kitchen...fish...food there...to go normally...to eat...and to eat...

GM

Gr: afti I gineka...afti I gineka vazi fai. Afti I gineka pleni ta
piata...afto...afto...psari...heheheh (laughs)...to...trapezia...i kuzina...i kuzina ine
edo...edo...pai...pai...pirunakia...pirunakia ine edo ine...ke dulapia...ke
dulapia...edw kita ba...piata...piata ine afta...edo katsarola etsi ine...edo I gineka
pleni piata...edo pu ta vazi afta...

En: this woman...this woman...puts food. This woman washes the
dishes...this...this...fish...hehehehehe (laughs)...the ...tables...the kitchen...the
kitchen is here...here...goes...goes...forks...forks are here are... and cupboards...and
cupboards...here look ba... dishes...dishes are these...here pot is like this...here the
woman washes dishes ...here where she puts them...

MX

Gr:
magirevi...pleni...psari...kuzina...tipota...gata...miaou...miaurizi...psari...patates...k
urtis (neologism)... bludin-blutzin... keri... kراسي... kab-kam-kamapes.... Krevati...

En: cooks...washes... fish.. kitchen... nothing... cat... miaou...miaws(sound of cat)...
fish... potatoes... *kuris* (neologism) bluedean-bluejean... candle...wine...co-co-
couch ...bed...

XL

Gr: ax...den boro...fai edo kani...ax den boro...fai...ax ne...fai... pleni... den boro. Triadafilia edo...afto...kuzina...aftos pedia...edo gati...la... afti...po...po...bukali...keropiia ke edo...aftos irthe na anapsi keru...den boro na katalabo

En: ah...i cant...food here she makes...ah I cant... food...ah yes ...food...washes...I cant. Roses here ...this...kitchen...he...kids...here...cat...*la*...she...po...po... bottle...chandelier and here... he came to light candle...I cant understand

DS

Gr: edo ine...*vadi*...bam...edo ine ta... ine *kamatos* . edo ine adras... ine mesa sto...ine mesa sti kuzina...afti magirevi, magirevi...ekini de ksero...to psari...to pleni...edo ine to...edo ine ...edo ine to -ina... edo ine to pari...edo ine ta pirunia... edo ine ta piata... edo ine ta (neologism)

En: here is ...*vadi*...bam...here are the... is...*kamatos*...here is man...he is in ...he is in kitchen...she cooks, cooks...she I don't know... the fish ...she washes it...here is the...here is ... here is the...-ina...ere is the fish...here are the forks...here are the dishes...here are the --- (neologism)

MC

Gr: to fagito...to koritsi exi fagito. To agori...e... pleni ta piata. Apo do mesa...psari ine... e afto ine entaksi...aplo. Katsarola den... ti alô. A olá mazi... furno...furno mikrokimaton... perioxi omos? Kuzina...gi afto...ntaksi...ne...apo do ta eipame...piperi...maxeropiru...oxi...maxeri...kutali...alati...alati ke piperi...gi afto...petai... petaluda ine. Tria atoma...tria atoma ine stin para. To koritsi...ti agori...anaboune... tis labes...fagito...gliko...ntaksi...afta perisevune...to ipa gia ligo...to ipa se ligo...alla ...

En: the food...the girl has food. The boy...e...washes the dishes. From here...fish it is...e... this is ok... simple. Pot not...what else. Ah all together...oven...microwave oven...plaece though? Kitchen..thats why...ok yes from here we said...peper... knives...no knives...spoon...salt ...salt and peper...that's why...flies... butterfly is. Three people...three people are in the company. The girl...the boy...light the bulbs...food ...sweet/desert...ok. These are more than enough.....i said it for a while...I said it in a while...but...

Appendix II

Items used in the Greek version of the Object and Action Battery

Items used in Action Naming (n=60)

Barking	Drinking	Painting	Sitting
Begging	Dripping	Pinching	Sleeping
Bending	Eating	Planting	Smoking
Biting	Fishing	Playing	Snowing
Blowing	Flying	Pointing	Stopping
Building	Folding	Praying	Stroking
Combing	Ironing	Pushing	Swimming
Cooking	Kicking	Raining	Tickling
Crying	Kissing	Reading	Tying
Cutting	Knitting	Riding	Walking
Dancing	Knocking	Roaring	Washing
Digging	Laughing	Running	Watering
Drawing	Licking	Sewing	Waving
Dreaming	Lighting	Shaving	Weighing
Drilling	Melting	Singing	Writing

Items used in Object Naming (n=60)

Anchor	Church	Grapes	Roots
Arm	Cigar	Hat	Saddle
Axe	Cigarette	Heart	Sandwich
Ball	Circle	Horse	Scissors
Bath	Comb	King	Shirt
Bed	Cow	Ladder	Square
Bird	Cross	Leaf	Strawberry
Book	Dog	Map	Tent
Brain	Door	Mouse	Tie
Bus	Drum	Nest	Tree
Button	Elephant	Pencil	Triangle
Camel	Envelope	Piano	Trumpet
Candle	Fish	Pig	Watch
Chair	Frog	Plug	Whistle
Cherry	Fruit	Pram	Witch

Appendix III

Sentence Completion task items

Verbs with alternating transitivity:

Sentences with the unaccusative version

1.
Ξαφνικά έγινε διακοπή ρεύματος. Στο διαμέρισμα όλα τα φώτα _____.
Ksafnika egine diakopi reumatos. Sto diamerisma ola ta fota esvisan.
Suddenly there was a power-cut. In the apartment all lights switched off

2.
Ο ήλιος έκαιγε και είχε πολλή ζέστη. Έτσι, τα απλωμένα ρούχα πολύ γρήγορα _____.
O ilios ekege ke ihe poli zesti. Etsi, ta aplomena rouha poli grigora stegnosan.
The sun was shining and the weather was warm. So, the hanging clothes very quickly dried.

3.
Μπορούμε να ρίξουμε τα μακαρόνια στην κατσαρόλα. Το νερό _____.
Mporoume na riksoume ta makaronia stin katsarola. To nero ebrase.
We can now put the pasta in the pot. The water boiled

4.
Ο Γιάννης σκόνταψε. Του έπεσε το ποτήρι από τα χέρια και σε χίλια κομμάτια _____.
O Giannis skodapse. Tou epese to potiri apo ta xeria kai se hilia kommatia espase.
John tripped over. The glass fell from his hand and in thousand pieces broke.

- 5
Το ψυγείο έμεινε χωρίς ρεύμα. Όλα τα φαγητά που ήταν μέσα _____.
To psigio emine xoris reuma. Ola ta fagita pou itan mesa xalasan.
The refrigerator stopped working. All the food that was in it went bad

- 6
Όλοι οι μαθητές ήθελαν να βγουν διάλειμμα. Μόλις χτύπησε το κουδούνι η αίθουσα _____.
Oli I mathites ithelan na bgoun dialima. Molis xtupise to koudouni, I aithousa adiase.
All the students wanted to go out for a break. As soon as the bell rang the room emptied.

- 7
Ήταν η πρώτη προβολή της ταινίας. Όλα τα εισιτήρια πουλήθηκαν και η αίθουσα _____.
Itan I proti provoli tis tenias. Ola ta isitiria poulithikan ke I ethousa gemise.
It was the premiere of the movie. All tickets were sold and the cinema (was) filled.

- 8
Χθες άφησα το παγωτό έξω από το ψυγείο και έτσι το παγωτό _____.
Hthes afisa to pagoto ekso apo to psigio ke etsi to pagoto eliase.

Yesterday I left the ice cream out of the fridge and so the ice cream melted.

9

Το αγαπημένο μου λουλούδι είναι το τριαντάφυλλο. Είναι πολύ όμορφο και υπέροχα

To agarimeno mou louloudi ine to trantafilo. Ine poli omorfo ke iperoxa mirizi
My favourite flower is the rose. It is very pretty and beautifully smells

10

Το παιδί είναι πολύ αδέξιο. Συνέχεια πέφτει και _____ .

To pedi ine poli adeksio. Sinehia pefti ke htirai.
The child is very clumsy. He always falls and hits.

11

Στην αίθουσα είχε πολλή φασαρία. Όταν μπήκε μέσα ο δάσκαλος οι φωνές

Stin ethousa ihe poli fasaria. Otan mpike mesa o daskalos oi fones stamatisan
The classroom was very noisy. When the teacher came in the yells stopped

12

Ο Γιάννης είχε ένα ατύχημα με το αυτοκίνητο. Πάτησε ένα καρφί και το λάστιχο

O Giannis ihe ena atixima me to autokineto. Patise ena karfi ke to lastixo eskase
John had a car accident. He drove over a spike and the tire burst.

13

Τα πουλιά είναι πολύ ξεχωριστά ζώα. Έχουν φτερά και στον ουρανό _____ .

Ta poulia ine poli ksehorista zoa. Ehoun ftera ke ston ourano petoun.
Birds are very special animals. They have wings in the sky they fly.

14

Οι διαδηλωτές είχαν κλείσει για πολλή ώρα τον δρόμο. Αφού ήρθε η αστυνομία ο

Oi diadilotes ixan klisi gia poli ora to dromo. Afou irthe I astinomia o dromos ανοικσε.
The protesters had closed down the road. After the police came, the road opened.

15

Για να ζεστάνει το σπίτι πήγε προς το τζάκι. Έριξε μέσα ένα σπίρτο και αμέσως η

Gia na zestani to spiti pige pros to tzaki. Erikse mesa ena spirto ke amesos I fotia
To make the house warm he headed towards the fireplace. He threw in a match and

immediately the fire lit.

16

Ξαφνικά φύσηξε ένας δυνατός αέρας και η πόρτα με θόρυβο _____ .

Ksafnika fisikse enas dinatos aeras ke I porta me thorivo eklise.
Suddenly a wind blew and the door with a big noise closed.

Sentences with the transitive version

1.
Ήταν και οι δυο πολύ κουρασμένοι. Είπαν καληνύχτα, έπεσαν στο κρεβάτι και _____ τα φώτα

Itan ke oi dio poli kurasmeni. Ipan kalinixta, epesan sto krevati ke esvisan ta fota
They were both very tired. They said goodnight, got into bed and switched off the lights

2
Έγιναν μούσκεμα από τη βροχή. Γύρισαν σπίτι, πήραν το πιστολάκι και _____ τα μαλλιά τους.

Eginan mouskema apo ti vrohi. Gyrisan spiti, piran to pistolaki ke stegnosan ta mallia tous.

They soaked from rain. They got back home, took the hairdryer and dried their hair.

3
Ήθελε να φτιάξει τσάι. Πήγε λοιπόν στην κουζίνα και _____ νερό.

Hthele na ftiaksi tsai. Pige stin kouzina ke evrase nero.

He wanted to make some tea. He went to the kitchen and boiled water.

4
Ακούστηκε ένας δυνατός θόρυβος. Με μια δυνατή κλωτσιά ο Γιάννης _____ το τζάμι.

Akoustike enas dunatos thorivos. Me mia dinati klotsia o Giannis espase to parathiro.

There was a great noise. With a strong kick John broke the window.

5
Όλα ήταν πολύ καλά μέχρι που αρχίσαμε να μαλώνουμε. Αυτός ο τσακωμός _____ τη διάθεση μου.

Ola itan poli kala mexri pou arxisame na malonoume. Aftos o tsakomos mou xalase ti diathesi.

Everything was fine until we started fighting. This fight ruined/destroyed my mood

6
Μόλις γύρισε από τις διακοπές ο Γιάννης _____ τη βαλίτσα του από τα ρούχα.

Molis gyrise apo tis diakopes o Giannis adiase ti balitsa tou apo ta rouha.

As soon as he came back from vacations, John emptied his suitcase from clothes.

7.
Διψούσε πάρα πολύ. Γι' αυτό και _____ το ποτήρι του μέχρι πάνω.

Dipsouse para poli. Gi auto ke gemise to potiri tou mexri pano.

He was very thirsty. That is why he filled his glass to the top.

8
Χθες ο μάγειρας για να φτιάξει το γλυκό _____ το βούτυρο σε σιγανή φωτιά.

Xthes o magira gia na ftiaksei to glyko eliose to boutiro se sigani fotia.

Yesterday, the cook in order to make the cake melted the butter in slow fire.

9

Αναρωτιόταν από πού ερχόταν αυτή η μυρωδιά μέχρι που έσκυψε και _____ τα λουλούδια.

Anarotiotan apo pou erxotan afti I murodia mexri pou eskupse kai murise ta louloudia.

He was wondering where was that smell coming from until he bended and smelled the flowers.

10

Ο Γιαννάκης είναι πολύ ευγενικό παιδί. Πάντα πριν μπει στο δωμάτιο _____ την πόρτα.

O Giannakis ine poli eugeniko pedi. Panta prin mpi sto domatio xtipai tin porta.

Johnny is a very polite boy. Every time, before henters a room he knocks the door.

11

Ο τροχονόμος του έκανε σήμα. Πάτησε φρένο και _____ το αυτοκίνητο απότομα.

O troxonomos tou ekane sima. Patise to freno ke stamatise to autokinito apotoma.

The policeman waved at him. He hit the break and stopped the car immediately.

12

Για να τον εκδικηθεί πήρε ένα καρφί και _____ όλα τα λάστιχα.

Gia na ton ekdikithei pire ena karfi kai eskase ola ta lastixa.

To take his revenge, e took a nail and burst all the tires

13

Κάποιοι άνθρωποι είναι πολύ ασυνείδητοι. _____ τα σκουπίδια τους στον δρόμο.

Karpoioi anthropi ine poli asiniditi. Petane ta skoupidia tous sto dromo.

Some people are very unscrupulous. They throw their garbage on the streets.

14

Έκανε πολλή ζέστη στο δωμάτιο. Ο Γιάννης σηκώθηκε και _____ το παράθυρο.

Ekane poli zesti sto domatio. OGiannis sikothike kai anikse to parathiro.

The room was very warm. John got up and opened the window.

15

Επιτέλους μπορούσε να καπνίσει. Πήρε τον αναπτήρα του και _____ ένα τσιγάρο.

Epitelous mporouse na kapnisei. Pire ton anaptira tou ke anapse tsigaro.

At last he could smoke. He took his lighter and lit a cigarette.

16

Τα παιδιά ετοιμάζονταν να πέσουν για ύπνο. Για να σκοτεινιάσει στο δωμάτιο η μητέρα _____ τα παντζούρια.

Ta pedia etimazontan gia ipno. Gia na skotiniyasi sto domatio I mitera eklise ta pantzouria.

Children were about to go to sleep. To make the room more dark, mother closed the blinds.

Intransitive Verbs:

Sentences with the unaccusative verbs

1

Ο τραυματίας είναι αρκετά σοβαρά. Έχει χάσει πολύ αίμα και οι πληγές του ακόμα

O travmatias ine arketa sovara. Ehi xasi poli ema ke I pliges tou akoma emoragoun.

The injured person is in a serious condition. He has lost a lot of blood and his wounds still bleed.

2

Η άνοιξη είναι η εποχή που η φύση ζωντανεύει. Όλα πρασινίζουν και τα λουλούδια

H aniksi ine I epoxi pou I fisi zontanevi. Ola prasinozoun ke ta louloudia anthizoun.

Spring is the time when nature becomes vivid. Everything becomes green and the flowers blossom.

3

Έφτιαξα ένα караβάκι και το έριξα στο νερό. Είναι φτιαγμένο από φελλό και έτσι μπορεί και

Eftiaksa ena karabaki ke to eriksa sti thalasa. Ine ftiagmeno apo felo ke etsi bori ke epiplei.

I made a little boat and threw it in the sea. Its made out of cork and so it floats.

4

Ο Γιάννης κάθε μέρα πηγαίνει γυμναστήριο. Πάντα κουβαλάει μια μπλούζα για να αλλάζει γιατί

O Giannis kathe mera pigeni gymnastirio. Panta kouvalai mia mplouza gia na allazi giati idroni poli eskola.

John goes to gym every day. He always has an extra t-shirt with him because he sweats easily.

5

Είναι ένα πολύ ρομαντικό βράδυ. Έχει πανσέληνο και ψηλά στον ουρανό τα αστέρια

Ine ena poli romantiko bradi. Ehe panselino ke psila ston ourano ta asteria laboun.

It is a very romantic night. There is a full moon and up in the sky the stars shine.

6

Πρέπει να μαγειρέψω κάτι γρήγορα. Δεν έχω φάει τίποτα όλη μέρα και

Prepi na magirepso kati grigora. Den eho fai tipota oli mera ke pinao.

I need to cook something pretty soon. I haven't eaten anything all day long and I am hungry.

7

Έκανε τόσο πολύ κρύο έτσι που όλο μου το σώμα

Ekane toso polu krio etsi po olo mou to soma etreme.

He weather was so cold, so that my whole body trembled

Sentences with the unergative active morphology verbs

- 1
Τα κόμματα της αριστεράς _____ στο νέο νομοσχέδιο της κυβέρνησης.
Ta komata tis aristeras antedrasan sto neo nomosxedio tis kivernisis.
The parties of the left reacted to the new legislation of the government.
- 2
Η δημοσιογράφος πήρε συνέντευξη από τον δραπετή. Τον ρώτησε πώς κατάφερε και _____.
H dimosiografos pire sinentefksi apo ton drapeti. Ton rotise pos katafere ke drapetefse .
The reporter interviewed the fugitive. She asked him how he managed and escaped.
- 3
Ήταν πολύ αργά και έπρεπε να πάω σπίτι. Σηκώθηκα, χαιρέτησα την παρέα και _____.
Htan poli arga ke eprepe na rao spiti. Sikothika, xeretisa tin parea ke efiga.
It was really late and I had to go home. I got up, said goodbye and left.
- 4
Είναι ένα ηλιόλουστο πρωινό. Πάνω στα δέντρα, τα πουλιά μελωδικά _____ .
Ine ena iliolousto proino. Panw sta dentra ta poulia melodika kelaidoun.
It's a shiny mornind. On the trees the bird happily sing.
- 5
Η Μαρία είναι πολυλογού. Όλη την ώρα _____.
H maria ine polulogou. Oli tin ora milaei.
Mary is very chatty. All the time she speaks.
- 6
Η Μαρία άκουσε το μωρό να κλαίει. Αμέσως άνοιξε την πόρτα και _____ στο δωμάτιο.
H Maria akouse to moro na klei. Amesos anikse tin porta ke mpike sto domatio.
Mary heard the baby cry. She immediately opened the door and got in/entered the room.
- 7
Όταν κοιμάμαι με τον άντρα μου, ξυπνάω από τον θόρυβο γιατί όλο το βράδυ _____.
Otan kimame me ton antra mou, ksipnao apo ton thorivo giati olo to vradi roxalizi.
Whenever I sleep with my husband I sleep from the noise because all night he snores.

Sentences with the unergative passive morphology verbs

1

Ο Γιάννης είναι σπουδαίος αθλητής. Παρά τον τραυματισμό του _____ μέχρι το τέλος

O Gianni sine spoudeos athlitis, Para ton travmatismo tou agonostike mexri to telos.

John is a great athlete. Despite his injury he struggled/fought until the end.

2

Όλοι ξαφνιάστηκαν όταν τον είδαν να μπαίνει. Κανένας δεν τον κάλεσε εδώ, αλλά αυτός _____

Oli ksafniastikan otan ton idan na beni. Kanenas den ton kalese edo, alla aftos irthe.

Everybody was surprised when they saw him. Nobody invited him here but he came.

3

Όποτε μυρίζω πιπέρι αμέσως _____.

Opote mirizo piperi amesos fternizome.

Whenever I smell pepper, I immediately sneeze.

4

Βλέπω όνειρα κάθε φορά που _____.

Vlepo onira kathe for a rou kimame.

I see dreams every time sleep.

5

Δεν άντεξε την πίεση της δουλειάς και έτσι _____.

Den antekse tin piesi tis doulias ke etsi paretithike.

He didn't bear the pressure of the job and so he quit.

6

Η εταιρεία πηγαίνει πολύ καλά. Οι δυο τους _____ με μεγάλη επιτυχία

H eteria pigeni poli kala. Oi dio tous sinergazontai me megali epitixia.

The company goes very well. The two of them co-work/co-operate with great success.

7

Όποτε διαβάζω, πάντα στην ίδια καρέκλα _____

Opote diavazo, panta stin idia karekla kathomai.

Whenever I study, I always –in the same chair- sit.

Appendix IV

Error prone Items in the Object and Action Naming Study

Items which elicited more errors regardless the error type in Object naming

Total number of errors made for each item			
	Patient group (n=9)	Comparison group (n=9)	Total (n=18)
Roots	8	4	12
Map	8	3	11
Plug	6	5	11
King	8	2	10
Shirt	7	2	9
Witch	7	2	9
Bath	7	1	8
Circle	7	1	8
Whistle	7	1	8
Sandwich	6	2	8
Anchor	7	0	7
Bus	6	1	7
Door	6	1	7
Saddle	5	2	7
Trumpet	5	2	7
Bed	6	0	6
Cigar	6	0	6
Piano	6	0	6
Tent	6	0	6
Brain	5	1	6
Nest	5	1	6
Axe	5	0	5
Camel	5	0	5
Elephant	5	0	5
Envelope	5	0	5
Strawberry	5	0	5
Button	4	1	5
Ball	4	0	4
Bird	4	0	4

Cherry	4	0	4
Pig	4	0	4
Square	4	0	4
Triangle	4	0	4
Book	3	0	3
Candle	3	0	3
Cow	3	0	3
Fruit	3	0	3
Grapes	3	0	3
Hat	3	0	3
Mouse	3	0	3
Pram	3	0	3
Tie	3	0	3
Arm	2	0	2
Chair	2	0	2
Cigarette	2	0	2
Cross	2	0	2
Drum	2	0	2
Fish	2	0	2
Heart	2	0	2
Horse	2	0	2
Leaf	2	0	2
Pencil	2	0	2
Scissors	2	0	2
Tree	2	0	2
Church	1	0	1
Comb	1	0	1
Frog	1	0	1
Ladder	1	0	1
Dog	0	0	0
Watch	0	0	0
Total	242	32	

Items which elicited more errors regardless the error type in Action naming

Total number of errors made for each item			
	Patient group (n=9)	Comparison group (n=9)	Total (n=18)
Roaring	9	5	14
Tickling	9	5	14
Stopping	8	4	12
Begging	9	2	11
Dreaming	9	2	11
Folding	7	3	10
Riding	7	3	10
Drawing	7	2	9
Shaving	8	1	9
Biting	7	1	8
Building	6	2	8
Crying	5	3	8
Dripping	7	1	8
Eating	5	3	8
Sewing	7	1	8
Snowing	8	0	8
Stroking	6	2	8
Walking	6	2	8
Blowing	5	2	7
Drilling	6	1	7
Laughing	5	2	7
Licking	6	1	7
Melting	6	1	7
Weighing	7	0	7
Bending	5	1	6
Fishing	6	0	6
Knocking	6	0	6
Planting	6	0	6
Playing	6	0	6

Smoking	6	0	6
Waving	5	1	6
Writing	3	3	6
Barking	4	1	5
Cooking	5	0	5
Flying	5	0	5
Kicking	4	1	5
Kissing	5	0	5
Lighting	5	0	5
Pinching	5	0	5
Pointing	5	0	5
Praying	5	0	5
Pushing	5	0	5
Raining	5	0	5
Singing	5	0	5
Digging	4	0	4
Drinking	4	0	4
Knitting	4	0	4
Painting	4	0	4
Sleeping	3	1	4
Swimming	4	0	4
Tying	4	0	4
Reading	3	0	3
Running	3	0	3
Sitting	3	0	3
Watering	3	0	3
Combing	2	0	2
Cutting	2	0	2
Ironing	2	0	2
Washing	2	0	2
Dancing	0	0	0
Total	313	57	

Items which elicited most visual errors in Object Naming

Patient group		Comparison group	
Cigar	2	King	2
Door	2	Sandwich	2
Saddle	2	Button	1
King	1	Door	1
Plug	1	Saddle	1
Sandwich	1		
Brain	1		
Button	1		
Triangle	1		
Tree	1		

Items which elicited most visual errors in Action Naming

Patient group		Comparison group	
Crying	3	Tickling	4
Tickling	3	Crying	3
Shaving	2	Building	2
Drawing	1	Drawing	2
Eating	1	Writing	2
Folding	1	Biting	1
Knocking	1	Eating	1
Laughing	1	Folding	1
Melting	1	Roaring	1
Snowing	1	Sewing	1
		Shaving	1
		Waving	1

Items which elicited most misinterpretation of the picture errors in Object Naming

Patient group		Comparison group	
Saddle	1	Brain	1
Ball	1	Roots	1

Items which elicited most misinterpretation of the picture errors in Action Naming

Patient group		Comparison group	
Dreaming	4	Stroking	2
Stroking	3	Roaring	1
Folding	1	Bending	1
Laughing	1	Sleeping	1
Begging	1		
Lighting	1		
Sewing	1		
Smoking	1		
Stopping	1		
Waving	1		