

Some Aspects of Moroccan Arabic Agrammatism

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By

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This book first published 2010

Cambridge Scholars Publishing

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

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

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ISBN (10): 1-4438-2155-1, ISBN (13): 978-1-4438-2155-1

This book is dedicated to the memory of my father,
Mohamed DIOUNY
(1935-2009)

To my wife, Zakia NAGUIB
To my daughters,
Ihsane DIOUNY
Imane DIOUNY

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ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Dr. Loraine Obler and Dr. Thomas Marquardt for their detailed, painstaking and perspicuous comments on the first draft of the manuscript.

I would further like to thank Dr. El Mostapha Alaoui Fares; He has been generous with his time and ideas. He has taken a personal interest in my work which far exceeded any expectations and was the source of many ideas. I would not have come this far without him.

I would also like to thank Mrs. Ettahiri for her always kind and willing assistance, which made it possible for me to fully test my materials with patients at the Hospital “Unité de spécialités” in Rabat.

Many people have generously allowed me to make use of their time and have provided me with ideas and insights. Special thanks go to Brahim Tawakkoul, and Abdelkarim Mabchour who read various chapters of the thesis and provided corrections, and suggestions. Thanks are also due to Dr. Aziz Boudlal, for his feedback and comments on an early draft of the manuscript.

This research would have never seen the light without the financial support of the British Council and the Moroccan-American Commission.

Finally, my deepest gratitude to my family for putting up with me for the last few years and assisting me emotionally when I needed it most. For her constant support and understanding, I would like to pay tribute to my wife, Zakia, for her unending, and often unbelievable patience and assistance throughout all the ups and downs of this intellectual endeavour.

This book would have never seen the light without the financial support of the Moroccan-American Commission for Educational and Cultural Exchange (MACECE).

CHAPTER ONE

PRELIMINARIES

1.0 Introduction

The use of speech to communicate is an important human faculty. When speech ability is impaired or lacking, the impact on the person and his family is profound. Aphasia is an acquired impairment of language processes underlying receptive and expressive modalities caused by damage to areas of the brain that are primarily responsible for language function. The disorder usually occurs as a result of a stroke, intracranial hemorrhage, traumatic brain injury or tumor. It profoundly affects a person's ability to use and understand language. All components of the language system are at risk of impairment: the repertoire of, or access to the phonological form, the lexicon, and the syntax may be variously disrupted, and deficits may affect more than one component of the language system (Edwards, 1995). In addition, lexical impairment and/or the inability to use grammatical structures may also interfere with the aphasic's pragmatic knowledge. In short, aphasia may involve aspects of language expression and/or comprehension.

Agrammatism is a case of a more general language impairment known as Broca's aphasia. Very informally, Broca's aphasia is characterized by slow, non-fluent speech, reduction of phrase length and syntactic complexity, disprosody (disruption of normal prosody), and difficulties in ordering words, and putting them together into sentences. In addition, Broca's aphasics have difficulty producing function words and bound morphemes; content words, however, tend to be preserved. These features qualify agrammatic speech output as "telegraphic".

Although agrammatism was traditionally regarded as a production deficit, several studies (Caramazza and Zurif, 1976; Kean, 1985; Grodzinsky, 1990) have shown that Broca's agrammatic subjects also experience impaired comprehension of certain types of syntactically complex sentences. This finding has led many researchers (Kean, 1985; Grodzinsky, 2000) to assume the "Overarching Hypothesis", which characterizes agrammatism as a "central deficit", affecting the ability to

produce and interpret sentences. For example, if asked to choose who is the “pusher” in the following two sentences, agrammatic/Broca’s aphasics would usually interpret sentence (1a) successfully at above chance level, but would perform at a chance level (suggesting that they are guessing) for sentence (1b).

- (1)
- a. The girl pushed the boy.
 - b. The boy was pushed by the girl.

A comprehensive account of how production and comprehension abilities are affected in aphasia is of considerable importance because the nature and the extent of deficient and spared abilities have implications for language impairment research and for linguistic theory. Accordingly, the study of grammatical deficits in agrammatism has become the focus of cross-linguistic studies. A major research question in agrammatic research relates to the nature of verbal breakdowns involved in agrammatism and the level of grammar at which they could be best characterized. Agrammatism has been examined from different perspectives: the clinical perspective, the linguistic perspective, and the cognitive/perceptual perspective. From a linguistic point of view, grammatical deficit in agrammatism has been accounted for in terms of phonology (Kean, 1977), morphology (Lapointe, 1983), and syntax (Grodzinsky, 1984, 1990; Friedmann and Grodzinsky, 1997; Friedmann and Grodzinsky, 2000). From a processing point of view, grammatical deficit has been explained in terms of adaptive, compensatory, and mapping strategies (Kolk, van Grunsven and Keyser, 1985). A major question addressed in the above accounts is whether agrammatic production and comprehension reflect a partial or a total damage to the syntactic processing component: it is still a matter of debate whether agrammatism results from a deficit in grammatical knowledge or from a deficit in syntactic processing.

The aim of this chapter is to outline the place of the present investigation within the field of language impairment. The chapter defines the historical context within which this study is conducted, and sets out the background against previous studies of agrammatism. It also introduces the scope of the present study, outlining the objectives it attempts to achieve and the hypotheses it sets out to examine.

1.2 Background

The past few years have seen a growing interest by linguists in the field of neurolinguistics. Broadly speaking, neurolinguistics is the sub-field of linguistics that studies the relation between language and the brain, especially the correlation between brain damage and speech and language deficits. Its primary goal is to account for the neurological bases for language and use, and to determine the nature of the psychological mechanisms that constitute language and cognition. The idea that linguistics may be useful in the study of language disorders has been cited extensively in the neurolinguistics literature. Blumstein (1986), for example, argues that the organization of language and cognition can contribute to a better understanding of the nature of language deficits subsequent to brain damage.

Grodzinsky (1990) points out that the relation between language impairments and linguistic theories is “bi-directional”, in the sense that the latter provide the theoretical devices with which the patterns of deficit are analyzed, while the former provide neurologically based constraints on the organizational properties of linguistic theories. Miller (1991; quoted in Code, 1991) argues that a full grasp of grammatical deficits has significant consequences for the “management” of speech and language disorders (i.e., clinical treatment). Avrutin (2001) maintains that both theoretical linguistics and aphasia can inform each other. Language impairment research allows investigating the influence linguistic theory can have on our understanding of language breakdown, thus providing insights into the human unimpaired linguistic capacity. In short, linguistic studies of aphasia have implications for explanation of aphasia syndromes and language and speech processes.

Grodzinsky (1990) and Ouhalla (1993) credit Roman Jakobson as the first linguist who realized the importance of applying linguistic ideas to the study of aphasic speech patterns. Roman Jakobson's (1956) linguistic contribution to the study of aphasia hinges on a set of three dichotomies, the most useful of which involves the distinction between “selection” and “combination”. The dichotomy “selection/ combination” led Jakobson to predict two different types of aphasic disorders, namely Broca's aphasia, and Wernicke's aphasia. In the first type, termed “contiguity” disorder (associated with Broca's aphasia), the aphasic patient has problems arranging words and integrating them in a systematic and unified way. In the second type, termed “similarity” disorder (associated with Wernicke's aphasia), the aphasic patient has difficulty finding words. Roman Jakobson's linguistic account of aphasia is also associated in the

aphasiological literature with the “Regression Hypothesis”, according to which basic linguistic elements that emerge first in children are last to disappear in aphasia.

Since Jakobson’s seminal article (1941/1968) on aphasia, the relevance of linguistic theory to the study of aphasia has been the subject of an ongoing debate. Among the consequences of this debate is that a great number of experimental studies conducted on aphasia have seen the light. The claims made and the conclusions reached through these studies have led to an upsurge of competing models of grammar. The decision to implement or favor one linguistic approach over another relies heavily on the validity of the assumptions it makes and the reliability of the results it yields.

Grodzinsky’s (1990, 2000) linguistic account of production and comprehension deficits is no exception. His account has been attacked on two grounds. The first one relates to test design and test materials, both of which seem to lack validity and reliability. The second one lies in the interpretation of the results, which are difficult to replicate as Grodzinsky includes single case subjects in his studies (Caplan, 1995). Grodzinsky himself admits that the claims he made with respect to language impairments are, by no means, conclusive.

1.3 Rationale

Much research on aphasia has been carried out on English-speaking aphasic subjects. Consequently, the aphasic symptoms typically described were believed to be universal. Thus, English aphasic data were used as a reference whenever a case of an aphasic patient speaking a different language was presented. It was only in the 1980’s that a shift of focus took place. Several studies started to question the relevance of agrammatism as a category and to highlight the validity of some symptoms characterizing the deficit, namely the omission of grammatical markers/morphemes. Studies by Grodzinsky (1984, 1990) and Menn and Obler (1990) have shown that since grammatical markers behave differently in different languages, agrammatism can take a different form depending on the language under investigation (Benedet, Christiansen, and Goodglass, 1998). Let us consider the following examples:

(2) English

*Uh, oh, I guess six month... my mother pass away (Goodglass, 1976)

- (3) Spanish
 *Ser Correct
 Be. Inf correct (Gavarro, 2002)
 ‘That’s correct’
- (4) Algerian Arabic
 xdəm¹ → yəxdəm [y=j] (Mimouni and Jarema, 1997)
 worked-he he work
 “he worked” “he works”
- (5) Hebrew
 xamesh → yamin (Grodzinsky, 1984)
 five-fem. days-masc.

In (2) the English-speaking patient dropped the plural suffix /-s/ and the past morpheme marker /-ed/. In (3) the Spanish-speaking patient substituted the present tense for the infinitive. In (4) the Algerian Arabic-speaking subject used the present tense instead of the past tense. Example (5) is an instance of agreement mismatch between the adjective [xamesh] and the noun [yamin].

Examples (2-5) illustrate that in languages with a poor inflectional system like English, agrammatic subjects tend to omit inflectional affixes (the plural suffix /-s/ and the past morpheme marker /-ed/) and function words such as prepositions, and complementizers. However, in languages such as Spanish, Arabic and Hebrew, all of which have a rich morphological system, agrammatic subjects omit and/or substitute inflectional markers. Omission is allowed as long as it does not lead to the creation of a non-word in the language. For example in (4), dropping the tense marker /yə-/ led to the creation of [xdəm], which is the past tense form of the same verb. The essential generalization that comes from the data presented above is that agrammatism is characterized by omissions of inflectional affixes as well as substitution errors both in concatenative and non-concatenative morphology (Gavarro, 1993, 2002). Examples (2-5) also question the relevance of agrammatism as a natural category. If agrammatism is not a syndrome, then it is pointless to combine clinically defined groups of sufferers as they may actually be suffering from different symptoms. If each patient is different and aphasia is not a syndrome, then it makes sense to look only at the detailed profile of individual cases.

¹ All symbols used in this thesis are IPA symbols except /t̥, ɖ, ʂ, ɹ/ which stand for emphatics.

In contrast, little research has examined language breakdowns in Arabic-speaking aphasic subjects (Safi-stagni, 1991 for Saudi Arabic-speaking aphasics; Mimouni, 1997 for Algerian Arabic-speaking aphasics; Diouny, 2005, 2006 and 2007 for Moroccan Arabic-speaking aphasics). It was only in 2002 that Sahel conducted a research on Moroccan Arabic-speaking Broca's subjects and German-speaking Broca's subjects. Although his study was interesting, it, nevertheless, failed to deal with all aspects of verbal breakdowns. The study examined subject-verb agreement. Tense, however, was not investigated. Therefore, there is an urgent need for more cross-linguistic studies to explain verbal breakdown patterns and grammatical deficits in Arabic in general and Moroccan Arabic in particular.

Diouny (2006) presented results from spontaneous speech, picture description, and action and object naming tasks with four Moroccan Arabic-speaking agrammatic aphasics and four gender and age-matched control subjects examining verb and noun naming. For all the tasks, he found that the aphasics achieved high correctness scores for object naming, while action naming was severely impaired. To account for the observed verb-noun disassociation, he suggested that the Moroccan Arabic-speaking agrammatic aphasics suffer from a processing disorder that affects their ability to produce verbs, given their complex syntactic and morphological structure.

Diouny (2007) explored tense and agreement disassociation in agrammatic speakers of Moroccan Arabic as predicted by the Tree-Pruning Hypothesis (Friedmann & Grodzinsky 1997) with extension of the inquiry to determine whether the disassociation is production-specific and/or modality-specific. For all experimental tasks, he found that the MA-speaking Broca's aphasic subjects achieved high correctness scores for agreement, while tense was impaired. The results of the study suggested that the tense/agreement dissociation reported for Hebrew (Friedmann & Grodzinsky 1997) and German (Wenzlaff & Clahsen 2004) can be replicated in Moroccan Arabic. However, the syntactic account as outlined in Friedmann and Grodzinsky (1997) cannot account for the tense/agreement dissociation because Moroccan Arabic has the agreement node above the tense node.

The study of grammatical deficits in Moroccan Arabic could (1) provide insights into the language universals while also reflecting language differences, (2) enhance our understanding of the mechanisms underlying language processing, and (3) serve as a springboard for clinical treatment. In brief, the present research has the potential of making a significant contribution to linguistic theory and language impairment

research, and will help increase clinical awareness of aphasia and language impairment in Morocco.

1.4 Aims

There are two main reasons for undertaking this research: **(1)** manifestations of agrammatism differ across languages. Cross-linguistic evidence is vital to better understand the extent and the elusive nature of language impairment, and **(2)** the Government and Binding model (Chomsky, 1981, 1986, and 1995) as an appropriate tool of investigation is a fruitful framework to explain patterns of variation attested in aphasic performance across languages. The present investigation aims to examine the production and comprehension abilities of Moroccan Arabic-speaking Broca's agrammatic subjects. In particular, it is an attempt to test empirically Friedmann and Grodzinsky's syntactic account of agrammatic production (Friedmann and Grodzinsky, 1997; Friedmann and Grodzinsky, 2000).

Friedmann and Grodzinsky (1997) argue that functional categories (i.e., complementizers, inflectional and agreement markers) are underspecified at some syntactic level, namely the S-structure. Their one female patient failed to produce correct tense inflections, but consistently produced correct agreement inflections. Based on this finding, they suggest that in agrammatism there is dissociation between tense and agreement, according to which tense can be selectively impaired, while agreement cannot. To account for agrammatic production, they propose the Tree-Pruning Hypothesis (TPH), according to which the deficit in production lies in the tense node. Because of the impaired tense node, tense inflections, copula omissions and word order errors follow. Central to this claim is the observation that no other node above the tense node can project and as a result, the tree structure is pruned. Therefore, complementizers, wh-words, wh-questions, and embedded structures, normally generated above the tense node, are either deleted or ill formed. In severe cases of agrammatism, the complementizer (C), tense (T) and agreement (Agr) are underspecified. The Tree-Pruning Hypothesis is formulated along the following lines:

(6)

The Tree-Pruning Hypothesis

- a. C, T, or Agr is underspecified in agrammatism.
- b. An underspecified node cannot project any higher.

A further objective of this book is to examine the ability of MA agrammatic aphasics to comprehend syntactically complex structures such as relative sentences. To my knowledge, no research has ever investigated how agrammatic comprehension manifests itself in the Arabic languages. The comprehension deficit in agrammatism is accounted for by the Trace-Deletion Hypothesis (TDH) or rather the Revised Trace Deletion Hypothesis (RTDH), according to which traces in argument positions are deleted from the structural representations of agrammatics (Grodzinsky 1995a and b, 2000). Deletion of traces results in a thematically deficit semantic interpretation. The RTDH posits a Referential-Strategy, which assigns a referential noun phrase (NP) a theta-role based on its canonical position. The RTDH is formulated as in (6) below.

(7)

The Revised Trace Deletion Hypothesis

- a. Traces of θ -positions are deleted from agrammatic representations.
- b. Referential-Strategy: assign a referential NP a role by its linear position if it has no θ -role.

Unlike English, Moroccan Arabic has a rich inflectional morphology with relatively free word order. As such, it serves as a good testing ground for the claims advanced by Grodzinsky. The structure of Moroccan Arabic allows us (1) to examine to what extent Grodzinsky's account of production and comprehension deficits in agrammatism is tenable, (2) to what degree the conclusions reached are testable, and (3) to draw conclusions for cross-linguistic comparisons.

In summary, the present investigation has four overall objectives:

- 1) To investigate functional categories relating to tense and agreement.
- 2) To examine syntactic theories relating to tense and agreement.
- 3) To examine whether or not there is dissociation between agreement inflection and tense inflection.
- 4) To examine the extent to which the comprehension deficit in Moroccan agrammatics is accounted for by the RTDH.

To address these issues, the study examines morpho-syntactic features of Moroccan Arabic, where grammatical information is conveyed by adding inflections to verbs, nouns and adjectives, which vary according to gender, number and person. Syntactic structures such as relative clauses are also considered.

1.5 Assumptions

The study is undertaken with the following assumptions:

- 1) Tense inflection is impaired; agreement inflection is relatively intact.
- 2) An underlying syntactic deficit explains the failure of agrammatics both to produce grammatical morphemes in speech and to understand grammatical morphemes in sentences.
- 3) The patterns of sparing and loss in both speech production and comprehension indicate a “minimal” syntactic impairment.
- 4) There are dissimilarities among functional categories with respect to impairment; not all functional categories are equally deleted or unavailable in grammaticality judgment.

1.6 Organization of the book

Chapter **one** introduces the reader to the context of the present investigation, and sets out the background against previous studies of agrammatism in Arabic, hence the importance of cross-linguistic studies of agrammatism. The chapter also outlines the objectives of the study, the hypotheses it sets out to examine, and the assumptions it makes.

Chapter **two** provides a brief overview of aphasia in general and agrammatism in particular. The chapter also addresses some key issues surrounding agrammatism. The main issues in the debate relate to the following: (1) can agrammatism be considered a syndrome? (2) should patients be divided into aphasic groups (Kaplan and Goodglass, 1983)? (3) do agrammatism and paragrammatism co-exist in the same aphasic subject? And finally (4) which of the following methods is more reliable, the case study approach or the group study approach? The discussion of these issues has significant consequences for both experimental methodology and theory.

Chapter **three** reviews the literature on agrammatism. Its goal is to familiarize the reader with some of the recent research in aphasiology. The chapter outlines and critically examines the different accounts of agrammatic production and asyntactic comprehension. These accounts can be subsumed under three headings: processing accounts, linguistic-descriptive accounts, and psychological/adaptive or compensatory accounts.

Chapter **four** introduces the reader to the structure of Moroccan Arabic and the linguistic framework. A particular focus is placed on word order variation in Moroccan Arabic, and how linguistic theory can contribute to

a better understanding of this issue. Other areas of interest involve the interaction between tense and agreement. The chapter also sheds light on the linguistic theory within which the present study is conducted, namely, the Government and Binding (GB) theory (Chomsky, 1981, 1986), and the Minimalist Program (Chomsky, 1995, 2000). Of particular relevance to this study is Pollock's Split-Infl hypothesis (1989).

Chapter **five** provides a comprehensive account of the experimental design of the study. The subjects selected for the study are introduced, and oral production tests and structured tests are detailed. Spontaneous speech analysis allows us to quantify both spared and impaired linguistic features, while structured tests are used to investigate Friedmann and Grodzinsky's (1997) account of the production deficit in Arabic agrammatism, namely properties of functional categories relating to tense and agreement. A major research question is whether or not tense is impaired; if this is the case, does it implicate agreement as well? A further research question is whether or not the deficits observed in production tasks parallel those in grammaticality judgment. The chapter also examines the subjects' comprehension of active sentences, subject and object relative sentences. In particular, to what extent can Grodzinsky's (1995 a, b) (Revised) Trace Deletion Hypothesis account for asyntactic comprehension in Moroccan Arabic agrammatism?

Chapter **six** presents the results of the study and examines the research questions addressed in chapters one and five. It also discusses results from other languages with a view to highlighting the cross-linguistic implications of the present research and to examining whether or not its results are consistent with previous findings.

Chapter **seven** examines the production and comprehension data in the light of the syntactic/processing models outlined in chapter three. The chapter looks at the adequacy of each of the proposed models, and addresses the following issues: the noun/verb dissociation, the tense/agreement dissociation, and the comprehension of active sentences, subject and object relative clauses. An alternative model to the linguistic account is provided to explain both production and comprehension in MA agrammatism.

Chapter **eight** summarizes the main findings of the study and their implications for linguistic theory. It also discusses new avenues for future research.

CHAPTER TWO

HISTORICAL REVIEW OF APHASIA STUDIES

2.0 Introduction

There is no doubt that the origins of aphasia go back to the distant past. Benton and Joynt (1960) cited a number of historical references to speech disorders, many of which were instances of aphasia. Sextus Empiricus (200 A.D.) is believed to be the first person to have used the term “aphasia”, but with reference to philosophy. Valerius Maximus (30 A.D.) gave an account of a person from Athens who had difficulty remembering letters; he was hurt on the head with a stone. Morgagni (1682-1771) described cases of aphasia, many of which involved lesions in the left hemisphere. Goethe (1749-1832) provided a detailed description of motor aphasia in his *Wilhelm Meister’s* apprenticeship. His patient was unable to communicate because he had a brain lesion in the left side of the brain. Obviously all these examples show that speech disorders had been described before 1880. However, the physicians who undertook these studies did not provide compelling arguments; their descriptions were, most of the time, not based on clinical evidence. This is probably one of the reasons why their remarks went unnoticed.

In recent years, aphasia has been an important area of inquiry to a variety of disciplines beyond those of medicine and speech pathology. It is now studied as well by linguists, psycholinguists, and neurologists. There are obviously many reasons for this interest. One such reason is that neurologists, psychologists, and linguists believe that aphasia studies may provide an important clue as to the elusive character of brain-language relations. Another reason is that aphasia is a good testing ground for the psychological reality of linguistic components as well as an evaluation measure of psychological, linguistic, and neurological models of language processing.

The neurologist studies aphasia with a view to relating damage of particular parts of the brain to disturbances of specific aspects of language. Put differently, his/her aim is to examine the internal organization of the

brain in order to bring into focus the brain structures that are responsible for specific cognitive and psychological abilities.

The aim of the psychologist is to examine the psychological processes involved in different linguistic abilities such as speaking, writing, making linguistic judgments and others. If one function or linguistic ability is impaired while another is intact, this strongly suggests that the spared ability is independent of the impaired one (Menn and Obler, 1990).

Aphasia studies are of considerable importance to linguists because of their relevance for the “modularity of language book” (Grodzinsky, 2000; Avrutin, 2001). Most of the time, aphasics preserve normal cognitive skills; their deficit involves aspects of the language. Therefore, the existence of such impairments confirms the claim that language is an independent system which has its own laws. Linguistic studies of aphasia shed light on how a normal speaker processes language and determine the exact nature of the grammatical relations and their interaction. That is, through aphasia studies, the linguist hopes to gain insights into the validity of his/her linguistic framework and the reliability of his/her findings, and to provide a “theory-based view on the localization of a particular linguistic function”.

The following section brings into focus the most important types of language deficits and provides an account of these deficits with regard to their clinical symptoms. However, it is important to emphasize that the classification that follows is, by no means, exhaustive or absolute because aphasia results in different deficits and a number of syndromes that share common features.

2.1 Aphasia syndromes

For over a century, aphasic subjects have been described as having different combinations of symptoms that are related to specific brain lesions. The symptoms tend to co-occur, forming clusters that are referred to as aphasia syndromes. An aphasia syndrome can be defined as a set of symptomatic features prior to brain damage. These symptoms tend to bunch together into a few comparative clusters (Benson, 1979). The observation of the different patterns of brain damage has given birth to the notion of aphasia syndromes. To describe these syndromes, many labels have been used and many classification systems have been proposed. Some of these models of classification focus on the arbitrary distinction between motor aphasia (Broca’s aphasia) and sensory aphasia (Wernicke’s aphasia); other systems are based either on linguistic theories or neuroanatomical observations.

2.1.1 Broca's aphasia

The relationship between language impairments and brain lesions was described as early as the Greeks; however, all the credit seems to go to Paul Broca, who in 1861 presented the first well-documented research into aphasia. Such a discovery was to become a major turning point in aphasia research. He reported that his patient, Leborgne, lost speech when he was thirty-one. When he died at the age of fifty-one, Broca found that he had a brain lesion in the posterior part of the third frontal convolution of the left hemisphere. This and later research in 1865 convinced Broca that the third frontal convolution was the brain structure responsible for the motor programs that underlie the articulation of language (Motor aphasia). Broca also showed that in aphasia only specific areas of the brain were lesioned; this constituted the first compelling evidence that the brain is structured by its function.

Broca's aphasia results from damage to the posterior inferior lobe called Broca's area. The deficit is best characterized as "an expressive disorder of speech". There are a number of manifestations of this output disorder: (a) the omission or confused usage of function words, i.e. conjunctions, prepositions, articles, pronouns, auxiliaries and copulas; (b) the loss or confusion of verb, noun and adjective inflections with frequent reversion to the unmarked form (e.g. verbal infinitive, nominative singular of nouns); (c) a reduction in the occurrence of verbs in comparison to nouns or the nominalization of verbs in some forms of agrammatic speech; and (d) omission of arguments (e.g. subject and direct object, and disordering of syntactic constituents). Broca's subjects exhibit little difficulty in accessing certain lexemes (i.e. nouns, adjectives, and adverbs), but omit or find great difficulty in deploying grammatical functions.

2.1.2 Wernicke's aphasia

Broca's aphasia is usually contrasted with another language impairment known as Wernicke's aphasia. A few years after Broca's discovery, Carl Wernicke described an area positioned differently from that of Broca that results in a different kind of aphasia (sensory aphasia). He found out that damage to the temporal lobe results in a loss of the ability to comprehend language. This is due to the impact of the lesion that causes loss of memory for the "images" of words.

Wernicke's aphasia is characterized by language input and output impairments. Wernicke's speech is fluent, except for pauses that may

occur as patients experience word-finding difficulty. Rate, intonation, inflection, and stress are normal, but the speech of Wernicke's patients is lacking in both content and meaning. Substitutions of one word for another are common in their speech. Auditory comprehension is severely impaired. In short, Wernicke's aphasics experience the following problems: (a) recall of lexical items related or unrelated to target lexemes, (b) nonsense neologisms (paraphasia), and (c) difficulty in retrieving nouns (anomia).

2.1.3 Conduction aphasia

Wernicke is also credited with being the first researcher to predict the existence of conduction aphasia. Conduction aphasia is usually caused by lesions that interrupt the arcuate fasciculus—the primary nerve pathway connecting Wernicke's and Broca's areas. That is, conduction aphasia results from a lesion in the primary nerve pathways connecting Wernicke's and Broca's areas. It is best characterized by fluent speech and good language comprehension because the primary auditory cortex and auditory association areas (Wernicke's area) are intact. However, because the connecting pathways between the auditory and language areas and the area for planning and executing speech are disrupted, conduction aphasics are unable to repeat what they hear. Their fluent spontaneous speech is characterized by numerous phonetic substitutions-literal paraphasia ("fetter" for "better") (Blumstein, 1973).

2.1.4 Transcortical motor aphasia and transcortical sensory aphasia

Transcortical motor aphasia (TMA) is a rare syndrome. It is caused by damage to the cortical areas around Broca's area, which does not affect the arcuate fasciculus and Wernicke's area. Patients with TMA produce nonfluent speech. They have "a stumbling, repetitive, even stuttering spontaneous output" (Benson, 1979). However, they have a striking ability to repeat long and complex sentences. Their auditory comprehension is intact. Transcortical sensory aphasia (TSA) results from damage to the cortical area around Wernicke's area, which spares the arcuate fasciculus and Broca's area. Patients with TSA produce fluent speech; they are able to repeat what is said to them with little difficulty. Their auditory comprehension, however, is impaired.

2.1.5 Anomic aphasia and global aphasia

Lesions in the angular gyrus cause anomic aphasia. Anomic aphasics produce fluent, well-formed speech, but experience word-retrieval difficulties in connected speech and naming tasks. Such word retrieval failures generate unusual pauses, circumlocution and substitution of non-specific words. However, global aphasia results from lesions in the perisylvian area, extending deep into the subjacent white matter. It can involve the frontal, temporal, and parietal lobes. All language modalities are affected: auditory comprehension, verbal expression, word finding, reading and writing.

2.2 For and against the classification system

The validity of the above classification system has been widely criticized. Caplan (1987) presents three arguments against the taxonomy of aphasia syndromes. First, a single symptom may encompass a number of other possible syndromes. For example, a patient with the syndrome may display different language impairments. It is not at all clear what it means for a patient to be a member of an aphasic group.

All we can say about a patient who has ‘Broca’s aphasia’ is that he has one or more of a number of abnormalities of speech [...]. This is not enough to be able to say exactly what linguistic and psychological problems the patient shows in detail (Caplan, 1987).

Second, many linguistic impairments tend to overlap; aphasic patients share features with other groups and sub-groups. For example, a patient may be classified as a Broca’s aphasic because his speech is agrammatic and his comprehension is relatively intact though he has no difficulty articulating words. Byng et al. (1990) sum up this argument as follows:

It is unusual for a patient to show a perfect fit with a particular diagnostic category, and indeed, a patient with multiple language impairments, defying any typology, is the norm rather than the exception.

Third, if aphasic patients display different patterns of damage, then we expect their linguistic impairment and behavior to differ, too. However, this is not the case. Blumstein (1973) found out that Broca’s, conduction, and Wernicke’s aphasics behaved similarly with respect to “many linguistic features of phonemic paraphasias”. Unless studies present convincing arguments with supporting evidence on the expected differences

in the linguistic nature of symptoms found in more than one syndrome, the foundation of the classification argument will remain controversial.

A further problem with the classification system involves lack of objective standards and coding systems. For instance, an examiner may consider a patient agrammatic if utterances are one word long while another may score the patient agrammatic if a functional category (preposition or a complementizer) is dropped from a well-formed structure. In brief, there is no agreement among clinicians as to the features specification.

However, proponents of the classification systems of aphasia maintain that any typology of aphasia syndromes is likely to contribute to generalizations. Grouping aphasic patients into categories achieves many objectives:

It summarizes a set of cognitive impairments as a function profile, it refers to a probable damage in certain parts of the brain, and it offers information on the chances of recovery and prognosis (Sundet, 1991).

Despite the controversial aspect of the taxonomic approach, the division of the aphasic population into groups is widely agreed on to have some clinical validity. In recent years, most investigations of aphasia deficits have used the Boston classification system (Goodglass and Kaplan, 1983) for describing different groups of subjects. Below is a summary of the characteristic features of patients' language disorders.

Table 1: Classification of aphasic syndromes

Aphasia Type	Damage	Speech fluency	Comprehension	Repetition	Syntax	Word finding
Broca's	frontal lobe	xxx	x	x	xxx	x
Wernicke's	temporal lobe	-----	xxx	xxx	x	xxx
Conduction	arcuate fasciculus	x	---	xxx	---	x
Transcortical motor	anterior or superior to Broca's area "extrasyllvian"	xxx	---	---	xxx	x
Transcortical sensory	Left supramarginal gyrus or left auditory cotex	----	xxx	---	x	x
Anomic	angular gyrus	---	---	---	---	xxx
Global	fronto-temporo parietal	xxx	xxx	xxx	xxx	xxx

xxx = (severely impaired; x = (mildly impaired); --- = (little impaired)

2.3 Early accounts of agrammatism

Agrammatism has received considerable theoretical and experimental attention in language impairment studies. There have been many attempts to define agrammatism. The definitions offered are often dependent on the linguistic and psycholinguistic framework of individual researchers. However, one defining feature of agrammatism which has widespread acceptance among neuropsychologists and clinicians is that it is a condition characterized by the omission of function words such as pronouns, auxiliaries, complementizers, etc. Inflectional morphemes relating to tense and agreement are either omitted or substituted depending on the internal structure of languages (Grodzinsky, 1990, 2000; Gavarro, 2002).

The earliest reference to agrammatism goes back to Kussmaul (1877) who described “agrammatismus” as disturbing three aspects of sentence production: an “unbroken flow of words, use of articles, verb auxiliaries and prepositions, and arrangements of words in certain order” (Davies, 1983). However, Kussmaul did not offer a full descriptive account of this syndrome.

Pick (1913) was the first investigator to define agrammatism as a specific language disturbance. He drew a distinction between motor “agrammatism” and “pseudo-agrammatism”, i.e., paragrammatism. He argued that agrammatism could be considered as a “breakdown in a middle phase of the development of a sentence” (Goodglass, 1968). Pick not only described agrammatism, but also proposed the “economy-of-effort” theory, according to which agrammatics use “emergency” language with all redundant elements being left out. Put simply, the loss of grammatical structures is due to the patients’ difficulty to produce speech and subsequent attempts to use “emergency” language are similar to the language used in telegraphs.

Isserlin (1922) offered a detailed description of agrammatism. He reviewed the literature on speech and concept formation, and pointed out that the non-verbal performances of agrammatics are often associated with their failure to find words. Like Pick, he maintained that the telegraphic style agrammatics use is due to an articulatory problem, i.e., agrammatics have difficulty using speech. The difficulty in uttering words affects directly the behavior and attitude of agrammatics toward expression. As a result of this negative attitude, the speech of an agrammatic is reduced and its form corresponds to that of children (the Regression Hypothesis).

Kleist (1934) was the first researcher who introduced the concept of paragrammatism in contrast to agrammatism. He realized that the problem

of motor aphasics lies in the use of names of concepts in sentences. Motor aphasics might know them, but they have difficulty combining them with other words into sentences. Kleist distinguished different kinds of motor aphasia and sensory aphasia. Among these varieties were agrammatism and paragrammatism.

Two remarks are worth mentioning about Kleist. First, he believed that agrammatism could also result from damage to the posterior part of the left hemisphere. Second, and as a consequence of this, it was possible to witness cases of agrammatism and paragrammatism in the same patient. The idea that agrammatism and paragrammatism may co-exist in one patient went unnoticed until the 1980's when Grodzinsky (1984) found out that both omission and substitution of morphological markers may characterize agrammatic speech output.

Goldstein (1948) considered agrammatism a regular feature of motor aphasia. For him, the motor aphasic uses more nouns and verbs, dropping articles, prepositions, and other functional categories. Goldstein supported the view of Pick and Isserlin concerning the agrammatic's use of "emergency" language. He also drew attention to another syndrome, namely conduction aphasia, which he believed, affects the ability to use functional words.

Jakobson (1956) was the first linguist to offer a linguistic account of agrammatism. He distinguished two components of language: the paradigmatic and syntagmatic. He pointed out that the paradigmatic component refers to the "evocation of verbal symbols for specific referents"; while the syntagmatic element refers to the sequential aspect of language, manifested in grammatical relationships" (Goodglass, 1976). "Similarity disorder" (Wernicke's aphasia) results when the paradigmatic (selection) aspect of language is disrupted; however, "contiguity disorder" (Broca's aphasia) occurs when the syntagmatic (combination) aspect of language is affected. The agrammatic subject has a contiguity disorder because he/she can not put phonemes together to form words and words to form grammatical structures, which are ranked in a "hierarchy of resistance". For example, in this hierarchical system, relations of government (e.g., possessive) are more vulnerable to impairment than those of agreement. Jakobson predicted the profusion of errors of the former category in comparison to the latter.

Luria (1970) provided further evidence that agrammatism is a disorder affecting the anterior part of the brain. To account for agrammatism, he introduced a linguistic contrast between the nominative and predicative uses of language. Luria argued that the motor agrammatic has an impairment that disturbs the "dynamic context of language" (predicative

function). What the agrammatic has at his/her disposal are individual words used in their “nominative function”. In other words, the agrammatic can only make use of the nominative function of language (e.g., nouns); the predicative use of language drops out (e.g., adjectives, prepositions). Luria rejected “the economy effort” theory advanced by Pick and Isserlin. He based his arguments on cases of patients who could come up with repeated attempts to have a successful production despite their language impairments.

2.4 Theories of agrammatism

Although agrammatism has long been viewed as a production deficit, recent research has confirmed that agrammatic subjects have production as well as comprehension impairments (Camarazza and Zurif, 1976; Grodzinsky, 1990, 1995a and b, 2000; Clahsen, 2008). This is referred to in the clinical literature as “Parallelism” to mean that there is a single underlying deficit responsible for impairments in both speech production and comprehension. Put differently, the grammatical morphemes disrupted in speech are unavailable for syntactic analysis in comprehension (asyntactic comprehension). Nevertheless, it is still controversial whether the deficits observed in production tasks parallel those in comprehension or in other input tasks such as grammaticality judgment. The reason for this controversy comes from the observation that many agrammatics seem to have intact comprehension (Miceli, Mazzucchi, Menn, and Goodglass, 1983; Nespoulous et al. 1988).

Although agrammatism has been a subject of interest for a long time, there are still many unanswered questions. One research question concerns the nature and the extent of the deficit involved in agrammatism, and the linguistic level within which the deficit could be best characterized: the phonological, the lexical, the morphological or the syntactic. Since the late 1970's (Camarazza and Zurif 1976), several theories have been put forward with a view to delineating the specific level of the grammar, which is implicated.

2.4.1 The phonological account

Kean (1977, 1979, 1980) argues that the omission of function words and some inflectional morphemes can be accounted for only in terms of an explicit phonological theory. No other theory -be it syntactic or morphological- can offer an explanation to the loss of these elements.