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MIDDLE EAST UNIVERSITY
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Speech Disorder and Brain Damage

إضطراب الكلام وتلف الدماغ

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Dedication

I dedicate this humble work to

Every person wishes me the best

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Speech Disorder and Brain Damage

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Abstract

This study aims at examining the linguistic disorders that takes place when a person suffers from brain damage. This investigation has been conducted by illustrating the linguistic features of brain damage sufferers such as: *syntactic, phonological, morphological, semantic, and pragmatic features.* The study specifically concentrates on what occurs to spoken language when certain areas of the brain are damaged by stroke or traumatic brain injury. Speech impairment followed by damage to certain areas of the brain is referred to as; aphasia. Neurolinguistic is the term used to describe the fields of study which focuses on neurology and linguistics. The research examines the works of Paul Broca as well as the works of Carl Wernicke which focuse on communication disorders caused by the damage of certain areas of the brain. Afterwards, the researcher qualitatively analyzed the linguistic features of speech disorders for seventeen aphasic patients. Finally, findings are discussed and explained in relation to the reviewed theoretical and empirical studies to explain the potential linguistic disorders that affect brain damage patient's speech.

Keywords: Speech Disorder, Broca's Aphasia, Wernicke Aphasia, Aphasia, Nuerolinguistics

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الملخّص

تسلط هذه الدراسة الضوء على الاضطرابات اللغوية الناجمة عن تلف الدماغ. تم إجراء هذه الدراسة من خلال وصف السمات اللغوية للمصابين بتلف دماغي (السمات النحوية، والصوتية، والصرفية، والدلالية، وعلم السياق اللغوي). الدراسة تركز بشكل خاص على ما يحدث للغة المنطوقة عند تعرض خلايا مناطق معينة من الدماغ الى عطب نتيجة الإصابة بسكتة دماغية او إصابة الدماغ الرضية ويطلق مصطلح الحبسة الكلامية على ضعف الكلام الناتج عن تلف مناطق معينة من الدماغ. المصطلح المستخدم لوصف مجالات الدراسة التي تجمع ما بين علم الأعصاب وعلم اللغويات يطلق عليها مسمى علم اللغويات العصبية. الدراسة تسلط الضوء ايضا على اعمال كل من باول بروكا وكارل ويرنيك والتي ترتكز على دراسة ارتباط تلف الدماغ باضطراب اللغة. لتحقيق أهداف الدراسة قام الباحث بالإعتماد على نتائج دراسات سابقة لوصف السمات اللغوية لاضطراب الكلام الناتج عن تلف مكتسب في مناطق معينة من الدماغ. بعد ذلك قام الباحث بعمل تحليل نوعي للخصائص اللغوية لسبعة عشر شخص مصاب باضطراب لغوي. وأخيراً، تتم مناقشة النتائج وشرحها فيما يتعلق باستعراض الدراسات النظرية والتجريبية لفحص الاضطرابات اللغوية المحتمل حدوثها بسبب تلف في الدماغ والتي بالتالي قد تؤثر على صحة الخصائص اللغوية لدى المصاب.

الكلمات المفتاحية: اضطراب الكلام، منطقة بروكا، منطقة ويرنيك، الحبسة الكلامية، علم اللغويات العصبية.

CHAPTER ONE
Introduction

1.1. Background of the Study

Verbal communication through languages is a distinctive aspect of human beings, as it facilitates conveying thoughts and feelings. Trying to understand how language is accurately created in the brain lies beyond scientific feasibility. Scientists and thinkers since Aristotelian speculations in the third century BC examined possible explanations of how language is processed and produced in the brain. Neurolinguistics, introduced by Harry Whitaker in the 1971, is defined as the proper and adequate understanding of language and its relationship with a variety of fields concerned with the structure and function of language and brain, minimally neurology and linguistics. Human brain and body activities share a direct relationship and any damage in the brain by stroke, traumatic injury, tumors, or nerve diseases such as Parkinson, stroke, and bleeding can affect other functions in the body. Damage in certain areas of the brain can lead to language loss due to the synergy between different body organs. Scientists believe that the growth in brain size has increased over the last decades due to the development of the spoken language. By a way of illustration, the frontal lobes, parietal, occipital, and temporal lobes are areas of the brain that evolved because of its connection to language production process (Wills, 1993).

Aphasia of language generally attacks adults who experienced or previously have experienced brain damage. On one hand, brain damage effectuates completeness of verbal abilities negatively. In addition to difficulties in understanding spoken or written language, reading, and writing (Sinanovico, 2005). Based on the results of the investigations that were conducted and that will be elaborated in the review of

literature, this study deals with the linguistic disorders acquired due to damage to certain areas in the brain. Linguistic deficit can be a result of brain stroke or traumatic brain injury. The researcher attempts to analyze brain relationship with speech and the relation between the severity and location of the brain damage with the cognitive or speech functions.

The field of neurolinguistics discusses the neurological factors that help human beings acquire, comprehend, and produce language (Altman, 2001). Moreover, psycholinguistics depicts the process of producing grammatical and meaningful sentences out of vocabulary and grammatical structures, and it is concerned with the processes that make it possible to understand utterances, words, and texts (Miller &Eimas, 1983).

The analysis of linguistic disorders is manifested in the use of various linguistic features. The first feature is phonology that entails phoneme and word paraphasia (substitution, deletion, and addition) (Blumstein, 1973). The second linguistic feature is morphology through depicting the omission or substitution of function words and the bound grammatical morphemes from the aphasic speech (Bates & Wulfeck, 1989). Thirdly, syntactic features entail the study of agrammatism that is defined by the production of short and slow speech phrase. It is also described through three frameworks (the mapping hypothesis, the adaptation hypothesis, and the trace deletion hypothesis) (Kolk, 1987). The fourth linguistic feature encompasses the semantic deficit in sorting words according to semantic associative fields through substituting words with other words that carry same semantic relations. Substitution occurs through; (same category, superordinate, subordinate, part of whole, attribute, spatial relation, circumlocution, or functional casual relation). Finally, pragmatic deficit can be

represented through communicative gestures and body communication and actions such as; (speech acts, prosody, turn taking and topic maintenance) (Ahlsen, 1995).

1.2. Statement of the Problem

Speech disorder acquired from brain damage is a field that has not been widely investigated. Researcher has noticed that there are no studies conducted locally or regionally about speech disorder caused by damage to certain parts of the brain specifically in adults, such as; Broca's area and Wernicke's area which are responsible for production and cognition of speech. The researcher observed that there are no studies conducted on Jordanian aphasic patients. The researcher was able to collect the data of seventeen Jordanian aphasic participants in a very difficult process; as many people are unwilling to socialize about their health conditions.

The researcher could not find any local studies that analyze Arabic speaking patients suffering language disorders acquired due to brain damage.

1.3. Objectives of the Study

This study aims to achieve the following objectives:

1-This study aims to explore what happens to spoken language when certain areas of the brain are damaged. As well as providing an overview of language relationship with human brain.

2-The study also aims at depicting the linguistic disorders caused by damage to certain areas of the brain.

1.4. Question of the Study

1- What are the linguistic disorders caused by neurological brain damage?

1.5. Significance of the Study

The significance of this study arises from its attempt to assess the possible linguistic disorders acquired after suffering a brain stroke or a traumatic brain injury. The researcher examined the linguistic disorders that led the sample of study to choose a certain speech type depending on the severity and location of brain damage.

Moreover, a sufficient base of empirical studies on linguistic disorders caused by brain damage was not found, and this study may help extending it.

1.6. Limitations of the Study

1- The study is restricted to seventeen patients who suffer from speech disorder due to brain damage.

2- The study is limited to seventeen participants suffering aphasia due to brain stroke, or traumatic brain injury.

3- The research is confined the study to include the linguistic disorders of the seventeen patients who were interviewed by the researcher. The study sample suffers from fluent and non-fluent speech disorders.

1.7. Limits of the Study

This study was conducted in Jordan during the second semester of the academic year (2021/2022).

1.8. Definition of Terms

Neurolinguistics: A linguistic field introduced by neurologist Paul Broca aiming at observing the relation between language disturbance and brain damage. The field concentrates on how the brain behaves during language processes, and how patterns and rules of human language are represented in the brain. In addition, neurolinguistics is

also interested in the assessment and treatment of patients suffering from aphasia. Neurolinguistics developed models to understand language production and comprehension (Bambini, 2012).

Broca's Aphasia: Is defined as the loss of the ability to understand speech or communication. Broca's aphasia occurs when the Broca's area in the brain is damaged**.** Broca's aphasia is also known as expressive aphasia as the patient is capable of comprehending the speech but unable to speak fluently (Corey, 2017).

Wernicke Aphasia: Can elucidate as a type of aphasia caused by damage to parts of the brain associated with language comprehension. The damage occurs in the left and right hemisphere and results in reduction of patient's ability to identify speech errors when replaying to conversation, the Wernicke aphasia sufferer are able to realize after a while that their speech is not correct (Damico & Ball, 2010).

Speech Disorder: An impairment that involves the processing of linguistic information. Both spoken and written communication is influenced by speech disorder which makes it difficult for the person to find the right words and form correct and clear sentences. Furthermore, the disorder can also result in difficulty of understanding what others say (Bansal, 2019).

Brain Damage: Damage to brain is a life threatening situation, which affect all the aspects of the patient's life. Brain damage might be a consequence of stroke, tumor, traumatic brain injury and many other brain diseases. The effects of brain damage can be multidimensional: cognitive, psychological and physical as well (Calgary Brain Injury Strategy, 2012).

CHAPTER TWO
Review of Related Literature

2.0 Theoretical Literature

The nineteenth century witnessed the greatest evolution of neurology and neurosciences of language. Franz Gall (1758-1828) developed the notion that each part of the human brain is responsible for a specific behavior, aptitude, and personality. Gall examined the skulls of criminals, insane people, politicians and famous people through a technique called Phrenology which aims at testifying topographic organs of the brain. Phrenology became widely used in Europe and in the United States of America and soon shock the reliability of neurology as a scientific field. In the 1861, Pierre Paul Broca, a celebrated physician obtained an authorization to autopsy a recent death patient that suffered from aphemia, which is a generalized loss of speech. During the medical examination of the brain Broca discovered a softening on a particular region, the posterior part of the left-frontal lobe, at the third circumvolution. Broca also scrutinized many patients with hemiplegia of the right side. However, they could not speak but could understand language. During autopsy, he noticed tissues injury in the third circumvolution. The autopsies revealed that the integrity of this area was necessary for the articulation of speech. The area of the brain that presented a connection with language production is known as Broca's area (Broca, 1861).

The research of Broca revealed three major ideas: language articulation lies in the third frontal convolution of the inferior frontal gyrus, the left hemisphere is responsible for language articulation and finally he discovered that understanding language is a different cognitive task than producing it. Patients diagnosed with deficit in Broca's areas show inability of producing grammatical utterances as their speech is slow,

repetitive, and lacks close class words (conjunctions, pronouns, preposition, and articles). In the early 1874s neurologist Carl Wernicke examined two patients suffering from hemiplegia of the right side of the brain. Their symptoms showed a senseless speech, they used a lot of grammatical markers (pronouns, prepositions, articles, and auxiliaries), and they seemed not to understand what was said to them. After Wernicke autopsied their brains, he noticed that they suffered from damage in the left temporal lobe, posterior to the primary auditory cortex. Wernicke's research revealed the affected area is responsible for the storage of sound images which is an essential part for understanding the speech (Binder, 2015).

2.1 Psycholinguistic Association with Neurolinguistics

The relationship between physiological process of the brain and psychological process of the mind remains a complex field. Most of language processes are not accessible to the conscious awareness; as we cannot consciously monitor more than a very small amount of decision making that are involved in spoken communication. Psycholinguistics entails the relationship between linguistic features along with the psychological factors. Psycholinguistics is mainly concerned with processes involved in the use of language; comprehension, and production of language. Psycholinguistic field is also concerned with the cognitive process of language acquisition within the human brain (Harely, 2005). According to German M. (1994) language impairment can be traced to include psychotic states not only neurological damage.

Psycholinguistics abilities that are examined by the neurolinguists in the study of aphasia are spontaneous speech, spontaneous writing, reading comprehension, repetition, and written words to objects matching. Psycholinguistics help neurolinguistic field in determining the areas of different linguistic disorder. Arguments in

neurolinguistics may start from linguistic and psycholinguistic concepts such as “sound image” or “auditory receptive field and conclude with neural structures such as; Wernicke and Broca’s area (Lamendella, J. T., 1979).

2.2 Brain Anatomy of Understanding

The human brain is divided in two hemispheres; right and left hemispheres, and each hemisphere is divided into five lobes; the visible lobes are: *frontal, parietal, temporal,* and *occipital* lobes. The hidden lobe is called *insula,* and is located at the bottom of the Sylvian fissure. Broca’s area is located in the posterior area of the left inferior frontal gyrus which functions as a main area for language production. Neurolinguistics use brain mapping method to obtain a view inside the brain regions and activities. Among the common brain mapping approaches are the Positron Emission Tomography (PET) and Magnetic Resonance Imaging (fMRI). Both methods locate which regions of brain are activated when human conduct different activities; through using blood flow pathway to differentiate between different parts of responsibility within the brain (Perani, 2022). Another method of brain mapping is the Transcranial Magnetic Stimulation (TMS); which delivers to the brain magnetic pulses through electrical current to depict the targeted area usually near the scalp. Another method is the electrophysiological technique which functions through stimulating the exposed parts of the brain and observing the consequences on behavior and cognition in a neurosurgical situation. Neuropsychology is also a traditional method which tracks the brain through language, for instance; it is utilized in cases of stroke, head injuries and tumors. Neuropsychology method is usually used for cases of stroke, head injuries, and tumors to determine the impaired area through its link with linguistic deficit.

The brain is protected by three structures called meninges. Underneath the meninges is the cerebrum which is divided in two cerebral hemispheres; the right and the left. Specific areas in both hemispheres are known for their ability to analyze sensory data, perform memory functions, obtain information and thoughts, make decisions, and articulate language. The right and left hemispheres communicate with one another through nerve fibers, called the corpus callosum (Chiarello, 1998). The two cerebral hemispheres are divided into sections with named lobes each has different specialization named lobes: frontal, parietal, temporal and occipital (Fig. 1).

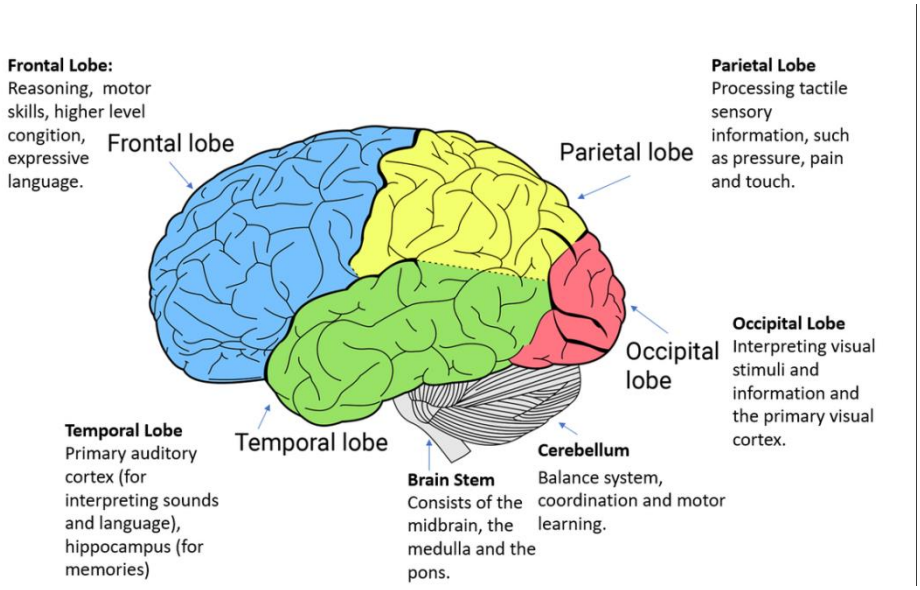


Figure (1): The Brain Lobes

In general terms, the frontal lobe is responsible for the articulation of speech, attention and organization. The parietal lobe is responsible for all sensory organs and is also required to decode written language. The occipital lobe is located behind the parietal lobe is responsible for delivering the first visual information coming from the eyes and the identification of objects (Ungerleider & Mishkin, 1982).

Goodale (1995) discussed the importance of the temporal lobes through receiving and processing sound information directly from the ear by encoding phonological representations. Reading a written text means that the information will go through the occipital lobe, where the primary vision cortex lies. Temporal lobes importance lies not only in processing of sensory processing but also in information storage and maintenance. Other temporal parts process music and integrate sensory sensations of sight, touch, sound, and taste.

Broca startled the Anthropological Society in Paris when he conducted his famous autopsy which revealed that "The seat of articulate language" is located in the inferior frontal gyrus of the left frontal lobe. Broca examined a patient who was called by his nickname "Tan". The patient suffered from a cyst on the brain which caused him speech aphasia. Tan was only capable of uttering the single syllable "Tan" due to the inability to mobilize the organs of articulation to produce the spoken form of words. The patient suffered disorder in spoken language but the muscles of the face, lips, tongue and jaw were unimpaired. Broca description of Tan's condition of inability of voluntary moving the internal organs responsible for speech production was called by him as aphemia. The medical condition of Tan would be called nowadays as speech dyspraxia. Broca's aphasia encompasses a broader range of language impairments that Broca himself described. Patients who suffer from major damage in Broca's area in the brain suffer from speech difficulties and show signs of loss in the grammatical words and in the inflectional morphemes, an impairment which is known as agrammatism. Another important aphasiology was introduced by Carl Wernicke who discussed another area of language damage in the brain. The patients who suffer from Wernicke's aphasia tend to speak fluently but they do have problems with the phonological form of some words,

such as omitting some letters from the words, for example they utter the word “trying” as “tying” and “recuperation” as “repuceration” (Pearce, 2009).

2.3 Linguistics in Neurology

Neurolinguistics attempts to identify how and where language is located in the brain and what is doing there. As imaging studies become more advanced the more the language-brain secrets are increasingly revealed. Studying brain insults help understanding how the brain function, where it’s easier to study impaired or damaged areas rather than studying functioning areas. Paul Broca and Carl Wernicke in the 1800s started their researches in the brain areas to identify that the neural seat of language is located in the left hemisphere specifically in the temporal and parietal lobes. Broca’s area is mainly responsible for language production and any damage in this area will result in difficulties with morphology and syntax. Wernicke’s area is mainly responsible for language comprehension and any damage to this area will result in difficulty in forming correct semantics. Nouns and names of objects will be produced in the occipital lobe which is the center of vision in the brain. Verbs are produced in the frontal lobes motor cortex (Pulvermuller, 1999).

Words that denote gestures such as *picking* and *kicking* are produced in specific brain areas, known as the homunculus; which connects the cerebral cortex with other sensory parts of the body through sending impulses from the body to the spinal cord and then to the brain, and even if the action is only mentioned orally but not physically performed (Pulvermuller, 2001).

2.3.1 Phonetics and Phonology

Phonetics and phonology study the organization of sounds within a language. The brain transfers the sound through the auditory apparatus in phonetics. The sound goes

through the ear canal reaching the cranial nerve and then the auditory cortex. Speech is processed in the brain differently from other types of sounds. Phonology studies the way in which speech sound is processed in the brain to identify the meaning of each speech sound. The movement of air flow through respiratory tract creates sound waves which then produce language. Sound waves are differentiated from other noises that do not carry meaningful speech sounds (Pulvermuller, 2005).

2.3.2 Morphology

Morphology works along with phonetics to create meanings. Morphology takes into consideration not only words but also the smallest units that combine to create meaning; such as declensions, prefixes or suffixes. The brain process the grammatical structure of the words through identifying the individual components as units, then understand which parts of speech carry meaning or affects the meaning through addition or subtraction. For example, the word “stress” might denote different meaning such as being not relaxed at this moment or it might carry the meaning of concentrating on something. If “-ed” is added it becomes a past verb, if “-ing” is added it becomes a present verb, if “-ion” is added to a word it becomes a noun, and if “-ly” is added it becomes an adverb (Yoder, 2017).

Arabic morphology consists of different types of morphemes which are categorized as follows; templatic morphemes, affixational morphemes, and non-templatic word stem. Templatic morphemes are divided into three word stem; root, patterns and vocalisms. Root morpheme consists of three, four, or five consonants such as; the word "لاعب"shares the root morpheme "لعب". Words like Affixes are divided into prefixes, suffixes, and circumfixes. Arabic affixes can be prefixed such as; "س"which is equivalent to “will”, suffixes are added at the end of the word such as; "ون"which

denotes masculine plural in Arabic nouns, another example is "ات"which denotes feminine plurality in Arabic nouns, circumfixes "تن" is usually added to the word "انتن" which indicates subject imperfective 2nd person feminine plural. Arabic uses certain letters to denote feminine or masculine nouns while in English the "s" is used for plurality disregarding the gender. The non-templatic word stem is not produced by a root, pattern, or vocalism combination. Non-templatic word stem are usually derived from foreign names such as; "واشنطن"“Washington” or borrowed such as; "ديموقراطية" “democracy”. Foreign names when enters the Arabic language can be used with fixational morphemes. While some borrowed words can be used in templatic morphology which creates a new word root. Morpheme functions can be divided into derivational morphemes and inflectional morphemes which are similar to English language. Derivational morphology creates words from other words, stems, or roots where the original meaning of the words is changed. The word "لاعب"is derived from the root ,"لعب" in English also the word "player" is derived from the root "play". Inflectional morphology on the other hand keeps the meaning of the core word, for example the word "كاتب"and the word "كتّاب"where the meaning is preserved but the number is changed. Inflectional morphology in English is similar to Arabic, for example the word "writer" and the word "writers" preserve the same meaning but the number varies (Habash & Sadat, 2006).

Table (1): Features of Lexical Morphemes and Grammatical Morphemes.

	Lexical morphemes	**Grammatical morphemes**
Free morphemes	Content words (girl, run) • Can be inflected • Rich conceptual content • Semantically more autonomous	Function words (to, the, of) • Cannot be inflected • Mark grammatical relation • Semantically less autonomous

Table (2): Features of Derivational Morphemes and Inflectional Morphemes.

	Derivational morphemes (re, -ize, -able)	**Inflectional morphemes (-s,-ed,-est)**
Bound morphemes	• Create new lexemes • Closer to the stem • More open class • More restricted productivity	• Mark word-forms • More distant from the stem • Highly productive Closed class

2.3.3 Semantics

Semantics is the choice of specific lexicons to generate a message based on semantic features. People choose a specific word from all other words according to its ability to deliver the intended meaning within a conversation or a speech. A specific word is used to denote a specific meaning such as; location, details, feelings, numbers, life, and jobs, which are things that need specific word choice. When a person becomes increasingly engaged in a wide variety of activities, he/she will acquire more lexicons that fit each situation. Semantics is affected by what the speaker assumes the listener knows about language; the lexicon used with a child will differ from lexicons used by an adult (Yoder, 2017).

Wernicke's aphasia causes the patient to produce meaningless long sentences, fluent speech, adding unnecessary words, and poor auditory and reading comprehension. People who suffer from Wernicke's aphasia experience a great difficulty in understanding their own speech and other people's speech, therefore; they are unaware of their mistakes. People who suffer from Broca's aphasia often speak in short, meaningful phrases that are produced with great effort, and they often ignore words such as "is, and, the". Broca's aphasia may be rooted in an inability to process grammatical information and difficulty in naming certain words specially difficulty in naming verbs rather than words (DeWitt & Rauschecker, 2013).

2.3.4 Syntax

When a group of words stand together produces a phrase, then the phrase produces a sentence, and the sentence makes an utterance. Word order and punctuation are important to create a meaningful written or spoken utterance and such structural rules determine how the listener is supposed to understand what is being written or spoken. Word order is important in determining the intended meaning, for example; the sentences “please stand up” is a polite request, but if the speaker changes the word order into “stand up please” this will produce a disgruntled command. Word order is also necessary to determine the importance of the information provided, for example the sentence “the short girl is beautiful” here the importance emphasizes the information “short girl”, but in the sentence “the beautiful girl is short” the important information is the “beautiful girl”(DeWitt & Rauschecker, 2013).

2.3.5 Pragmatics

Pragmatics involves logic, semantics, and context, and it studies the use of words and sentences appropriately according to the social situation. The importance of pragmatics is obtained from its role in understanding the language and the responses, as it looks beyond the literal meaning of words and utterances. Pragmatics studies the rules that govern language use in context by considering the intended meaning of words and the construction of meaning in context, voice tone and body signs (Bates, 1976).

2.4 Aphasia

Aphasia is the loss of the ability of transferring thoughts into words due to a cerebral damage. Aphasia can be divided into *non-fluent* aphasia and into *fluent* aphasia depending on the linguistic output produced (Benson 1970, p: 373).

People suffering aphasia usually have difficulty finding words but in some severe cases aphasia can cause complete loss of the ability to speak, read, or write. The severity of aphasia can be a cause of brain hemorrhage, tumors, and stroke. Damage to the left hemisphere affects the domains of semantics, phonology, morphology, and syntax. Aphasia impairments in the production of speech arise from damage to the mechanism that controls the process of speech before the articulation, so aphasia is not an impairment of articulation (Code, 2019).

There are several types of aphasia under the Fluent and Non-Fluent broad categories. Figure (2) shows sub-categories for aphasia:

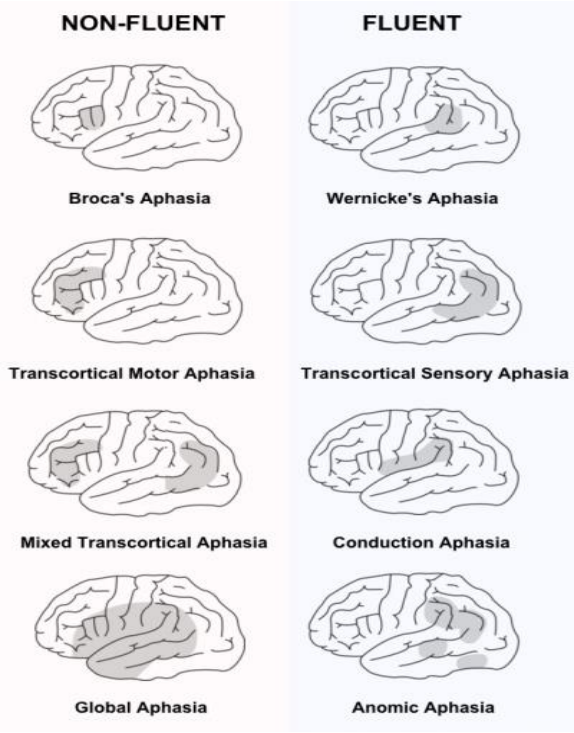


Figure (2): Fluent and Non-Fluent aphasias

2.4.1 Non-fluent Aphasias

2.4.1.1 Broca's Aphasia

This type of aphasia is named by Paul Broca as aphemia, which is also called motor aphasia by Carl Wernicke. However, non-fluent aphasia was given many names such as:

cortical motor aphasia, verbal aphasia, expressive aphasia, and transcortical motor aphasia. Non-fluent aphasia patients show a reduction in their ability to produce fluent verbal output in spoken language and writing. Non-fluent aphasia diagnosis revealed that patient's comprehensions remain intact or nearly intact especially within simple and relaxed settings rather than more complex and formal examinations which negatively affect the patient's comprehension (Isserlin, 1936).

2.4.1.2 Global Aphasia

Also named as the expressive-receptive aphasia is considered the most severe type of aphasia as it causes reduction in the patient's ability to produce all linguistic functions. Patients suffering from global aphasia cannot understand complex phrases and words, and they lose the ability to speak as they became only capable of pronouncing the simplest sounds (Weisenburg & McBride, 1935).

2.4.1.3 Transcortical Motor Aphasia

Transcortical motor aphasia is regarded similar to dynamic aphasia. Patients suffering from this type of aphasia show signs of intact comprehension along with reduced output. Sufferers of transcortical motor aphasia are able to name things, repeat phrases, and words but they face difficulty in writing (Lichtheim, 1885).

2.4.2 Fluent Aphasia

2.4.2.1 Wernicke's Aphasia

Wernicke aphasia is known as sensory aphasia. Wernicke aphasia sufferers show the ability to speak fluently but they cannot produce a meaningful utterance. Moreover, patients suffering from Wernicke aphasia show signs of severe comprehension impairment. Wernicke aphasia has been divided into three categories according to Hecaene: "Predominant word-deafness" an aphasia which causes impairment in the

reception of auditory signals with a limited ability to read. “Predominant impairment of verbal comprehension” is another type of Wernicke aphasia according to Hecaene categorization where the patients are unable to comprehend both written and oral language (1969, P: 229). According to Whitaker “Another type of Wernicke aphasia is known as; “Attentional disorganization” where the sufferers of this kind of aphasia show inability to comprehend the indented meanings**”** (1977, P: 3).

2.4.2.2 Conduction Aphasia

Conduction aphasia term was introduced by Carl Wernicke to describe cases diagnosed with injury in the pathway which connects Wernicke’s area and the Broca’s area. Such injury results in patient’s inability to choose the correct utterances to express themselves and they are unable to repeat words, but they maintain the ability to understand everything (Lichtheim 1885).

2.4.2.3 Transcortical Sensory Aphasia

This type of aphasia causes severe impairment in comprehension where the patient severity of injury can sometimes lead to loss of all linguistic functions; in some cases, only repetition remains intact. Echolalia is a term used to describe the case when repetition is the only remaining language function (Manasco, 2014).

2.5 Brain Damage and Language Disorder

Speech and language production processes include distinct activities in the cerebral cortex. Therefore, different types of injury in the brain will produce different types of speech disorder. Individuals may present physical, cognitive communication, behavioral disabilities, and incapacities at several levels. Speech disorder can be acquired through stroke, brain diseases, and traumatic injuries. Patients of aphasia may suffer from

psychological impairment due to the trauma of brain damage and its post effect on their life.

2.5.1 Parkinson Disease

Parkinson disease is a neurodegenerative disorder caused by dopaminergic deficiency in the basal ganglia, results in disrupted motor speech control and higher level cognitive deficit from the early stages of the disease. The patient may suffer from difficulties in comprehending complex sentences, verb inflection errors, and impaired lexical- semantic processing. The dysfunction in basal ganglia projects impaired signals to frontal regions of the brain, including Broca's area. Parkinson patients and Broca's aphasia patients suffer from difficulties in producing regular verb form (walk-walked). Parkinson suffers mostly affected in Wernicke's might produce errors with irregular verb forms (drive- drove) (Ullman, 1997).

Small (1997) examined written sentences production in individuals with Parkinson, using the Mini- Mental Status Examination. He found that sentences production was not impaired for participants with moderate Parkinson.

Troche and Altmann (2012) discussed the repetition and production of sentences of different complexity. They examined sentences with one preposition (The tired waitress served the customer) and another sentence with two prepositions (The angry nurse cleaned up the mess that the doctor made). In both sentences participants with Parkinson disease showed reduced accuracy, fluency, and completeness. Troche and Altmann conducted an experimental study by examining healthy patients, patients with agrammatic Broca's aphasia, and a group of people who suffer from Parkinson disease. The experiment looked into syntactic production through narrative story telling task (experiment 1) and a structure sentence elicitation task (experiment 2). The results

showed that participants with agrammatic aphasia showed clearly impaired syntactic production in both experiments. In story telling they produced few grammatical and verbal structure correct sentences. These results depicted that Broca's patients suffer from impaired syntactic processing in both structured sentence elicitation and narrative production contexts (Bastiaanse & van Zonneveld, 2005). Participants with Parkinson did not reflect impaired syntactic production in either experiment. Participants were able to produce verb argument correctly in sentences (Bastiaanse & Lenders, 2009).

2.5.2 Stroke

Stroke is one of the highest causes of disability and death in the world. Stroke affects mostly the middle cerebral artery which may cause the patient speech disorder. Stroke disease caused by cerebral blood vessel becomes an initial cause of speech disorder syndrome. Post stroke patients suffer from difficulty in speech, especially when combining words into sentences which indicates that in spite of the patients' cognitive abilities in language, they might have difficulty in expressing their speech. Stroke patients with speech disorder suffer decrease in understanding the words and the spoken sentences which results in patients feeling depressed due to the inability to carry out life activities easily. Aphasia sufferers experience negative impact on their independence, they suffer from unstable emotions due to the inability to communicate and eventually lose their self-esteem and they might feel depressed; as a result a physiotherapy is conducted at hospitals through medical advisor to restore the body functions after brain damage. Physiological therapy focuses on treating the medical damage in the left and right hemispheres. The medical treatment is expected to recover certain areas within the brain which ultimately will facilitate the process of speech recovery (Indah, 2021).

2.5.3 Agrammatic Aphasia

Broca's aphasia also called "non-fluent" aphasia caused by stroke in the inferior frontal lobe or Broca's area results in loss of the ability to produce a grammatical sentence structure. Broca's aphasia sufferers loose from their speech small linking words, conjunctions, or prepositions; such as "ب – انا -و". Broca's aphasia sufferer's speech is usually described as being *agrammatic*; as they use sparse grammar, simple sentences, and brief direct to the point words. Broca's aphasia sufferers usually tend to speak short structure sentences made up of nouns, and they may add main verbs, and adjectives, but they mostly delete function words and grammatical morphemes such as; verb inflections. In agrammatism functional morphemes are usually deleted or substituted from the speech, while; bound grammatical morphemes are rarely deleted, but are usually substituted. As a result, morphological and syntactic complexity makes grammatical formations difficult to process. In agrammatism simplification of complex structure is applied to help patients express themselves, a process which might contain many errors (Acharya, 2022).

Linguistic complexity plays a major role in defining the ability of aphasic patient to produce a better quality of speech. Verbs with complex structure which have many thematic roles are more complex for speech compared with verbs that have simple structures. Transitive verbs such as; bring or send are more complex as they have different arguments: someone who bring (an agent), and the thing that is being brought (the theme). The word "*send*" needs more arguments: the sender (the agent); and the thing that is being sent (the theme) and receiver of the thing (the goal); the more a verb needs arguments the more becomes complex for aphasic patients. Intransitive verbs like "relax" are easier to produce for aphasic patients; as they don't require arguments (Thompson, 2003).

Some agrammatic patients show longer reaction times (RTs) for verbs with multiple categories such as the verb "*deliver*", while verb with one sub categorization show shorter reaction times (RTs); "such as the verb *fix*". Patients who suffer from anomic aphasia show inability of producing nouns "objects", while Wernicke's aphasic patients do not present differential reaction times (RTs) to different verb structures, which means that Wernicke's aphasic patients show lack of sensitivity to different verb categorizations. Agrammatic patients show deficit in frontal regions, while anomic aphasia patients show deficit in tempo-parietal lesions; which indicates the unique roles for frontal and posterior areas of the left hemisphere in verb and verb argument structure processing. Using "FMRI" or the positron emission tomography "PET" reveals the left frontal convexity activation in verb processes and the activation of left temporal lobe in noun processing (Damasio & Tranel, 1993). Den Ouden (2009) found that posterior lobes are also connected with verb argument structure complexity, and the activation of transitive verbs in the left hemisphere Broca's areas and the surrounding areas.

Ahlsen (2006) argues that Wernicke's aphasia patients suffer from brain damage in the temporal and parietal lobes; causing fluent speech. The grammar of people suffering Wernicke's aphasia is described as *paragrammatism*. Patients of Wernicke aphasia can speak fluently but they keep restating and interrupting their own speech due to anomic problems in finding the proper words for the target speech context. The Wernicke condition imposes on patients to suffer from comprehension problems effectuating their speech to be made mostly from grammatical frames rather than nouns, adjectives, and main verbs; as they substitute them with grammatical morphemes.

2.6 Language Production

Language production describes the stages of speech from the mental concept to the spoken or written linguistic result. Language production involves the retrieval of information from memory to spoken or written form.

2.6.1 Spoken Words Perception

Speech seems to be a simple task understanding what is being said, but in fact this effortless process requires numerous computations. Spoken words are converted to multiple level codes depending on their linguistic structure weather phonemes, words, or syllables. The speech reaches the ears to the brain through signals which gets encoded in the cochlea then they move through three brainstem nuclei then to the thalamus before reaching the cortex, where sound frequencies pass through regions in the superior temporal cortex; specifically, the primary auditory cortex and auditory fields on the dorsal surface of the superior temporal gyrus (STG). Areas near primary auditory cortex detect simple speech sounds, while areas of the STG and the posterior superior temporal sulcus (STS) deals with more complex speech sounds. Left and right hemisphere work along with each other to support speech perception. Left hemisphere concentrate more in differentiating rapid auditory variations, such as; distinguishing the sound /p/ from /b/ at the phonemic level. While the right hemisphere concentrates more at information at syllabic level. After that a division of sound goes into two streams; the ventral stream and the dorsal stream. The ventral stream transfers sound into meaning while the dorsal stream transfers sound into action. The dorsal stream is dominated by the left hemisphere and supports short-term memory (Friederici, 2012).

2.6.2 Spoken Words Production

When the speaker wants to express his/her ideas using lexical items, the semantic features of each word are distributed through the brain, so the idea will be mapped in the brain with the specific words. The anterior temporal lobe (ATL) selects a meaning for the heard sound syllabification process occurs in the inferior frontal gyrus (IFG). The phonemic segments of the words are set together into syllabic units as the most frequently used syllables becomes stored in long term memory and ready to be retrieved easily whenever needed. Brain areas are organized bilaterally to depict the different parts of the vocal tract; larynx, lips, tongue, jaw, and palate. Vocal tract parts are coordinated with the signals relayed through subcortical nuclei in the brainstem and spinal cord before moving to the motor periphery parts. Speech production depends also on the feedback mechanism; as when a person needs to say a specific word, the sound of that word within the phonological network in the temporal lobe serves as an "auditory target" which identifies the target word. The signals sent from the brain to produce speech are compared with target representation, and if the brain detects any insult, instructions are sent to justify to the frontal articulatory network. This feedback system works with high speed and accuracy, allowing motor commands to the frontal articulatory network demanding speech production to be corrected to generate the expected feelings in the vocal tract (Guenther & Vladusich, 2012)

Kolk & Heeschen (1990) argue that deficit in speech result due to impairment in the language system; a reason which allows patients to strategically respond to their deficit through adapting a simplified "telegraphic" speech. Embrick, Marantz, Miyashita & O'Neil (2000) argue that Broca's area is specifically involved in syntactic processing, and that a certain amount of syntactic processing is also involved in the Wernicke's area and AG/SMG.

2.6.3 Reading

Reading seems easy but it takes a complex process in the brain to achieve reading. The written words extend from the retina to the thalamus, and then they move to the primary visual cortex located at the back of the brain. Anteriorly directed ventral occipitotemporal stations obtain a combination of informative and orthographic features. The process winds up in the Visual Word Form Area (VWFA) where written words are identified disregarding their size, font, or case. The VWFA is a cortical patch located in the fusiform gyrus, and is inherently designed to handle complex detailed shapes. Obtaining the actual meaning of written words depends highly on the areas of: anterior temporal lobe (ATL), parietal, and frontal areas. Words which have regular spelling form such as (door) are easily read by mapping the graphemes to the corresponding phonemes to produce semantics. Some other words with irregular spelling form such as (knight) needs to understood in terms of its meaning to be able to read it aloud especially if the reader did not encounter it before. Access to the correct pronunciation of printed words depends on the perisylvian circuit for speech processing depending on different structures which includes the ATL, temporal, parietal and frontal areas (Kemmerer, 2014).

2.6.4 Writing

When a word is selected in the visual word form area VWFA is saved in mind through the graphemic buffer, which consists of a short term memory which maintains the shapes and positions of the graphemes while the word is being written. Graphemes are kept in mind through being controlled by the Broca's area. Writing involves two stages the first one is known as the allographic conversion and the second one is known as the graphomotor planning. The allographic conversion is responsible for understanding the abstract graphemes such as; upper or lower case, separate or

connected letters. The graphomotor planning supplies the precise instructions to the motor system of the hand, such as the details about the size of letters (Kemmerer, 2014).

2.6.5 Sentence Comprehension

Understanding a string of words connected with others is underpinned by a large number of cortical areas that work synergistically to change the words into a unified message. The following sentences use different word order of the exact words to describe different events.

1- The driver who hit the boy was taken to the hospital.

2- The driver who the boy hit was taken to the hospital.

"The" is a definite article, "driver" and "car" are count nouns, "who" is a relative pronoun, "hit" and "taken" are transitive verbs. The exact division of this morphosyntactic features is not accurately localized, but it is known that such divisions mostly occur in the middle temporal gyrus MTG. The MTG receives the input from phonological network from the superior temporal gyrus STG and the superior temporal sulcus STS, which are responsible for recognizing the grammatical features of words. The middle temporal gyrus MTG works along with the Broca's area when ambiguous expressions are faced, such as the phrase "spinning spinner" in which "spinning" can be identified as either verb or an adjective. In such case where ambiguity is present the competing grammatical category assignment will be the responsibility of the middle temporal gyrus while the selection of a grammatical category according to the sentence context will be the responsibility of the Broca's area. Understanding a sentence depends on figuring out "who is doing what to whom", in the previous sentences (1) and (2) the structure of the main clause is the same in both sentences indicating that the "driver" not the "boy" was taken to the hospital. The sentences differ with the structure of the

relative clause, in sentence (1) the grammatical cues shows that the roles are reversed. When sentences are heard not read the short-term memory STM system known also as the phonological loop is activated to facilitate sentence comprehension. The STM consist of the phonological network the posterior STG/STS which activates the stored word forms. The STM consist of the ability of rehearsing the stored components which refreshes the content of the storage in the frontal lobe (Ahslen, 2006).

2.6.6 Sentence Production

Sentence production is related to a disorder called agrammatism, which was heavily studied during the 1980s and 1990s. Brain damage patients are usually examined for suffering five impairments related to sentence production: a paucity of main verbs; syntactic simplification, omission of free standing closed class elements, substitution of bound closed class elements, and over reliance on canonical word order. Patients who suffer from agrammatism have usually the brain damage located in the left prisylvian frontal, parietal, and temporal areas (Kemmerer, 2015).

2.7 Components of Language

Linguists have identified five basic components of language (phonology, morphology, syntax, semantics, and pragmatics).

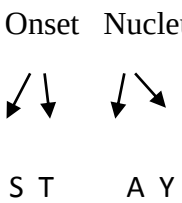
2.7.1 Frameworks in phonology

2.7.1.1 Neologisms

The term neologism is used in neurolinguistics to describe the newly made-up words in the case of people who suffer from Wernicke's aphasia or other types of aphasia. The term paraphasia refers to the substitution, deletion, or addition of a phoneme (Meyer, 2011).

Paraphasias can also produce other words as it can be paradigmatically and syntagmatically affected. Paradigmatic substitution occurs when a slot in speech is filled by another letter that serves in the place but producing a new meaning, such as; “car” instead of “can” so her the /r/ was substituted by /n/. Syntagmatic substitution occurs when a sound that is pronounced later is pronounced earlier; as the sound affects the ability to pronounce the letters according to its natural sequence, such as; “big dog” the “b” goes back instead of the “d” in “dog” so it becomes “big bog” (Buckingham, 1989).

Gandour (1998) defines sonority as the articulatory openness of the vocal track; sonority rises in the syllable until the vowel peak falls helping the production of phoneme. Patients will often rise in the sonority between the syllable and the nucleas to assist in forming a better quality of pronunciation.



Patients of jargon aphasia and Wernicke’s aphasia produce unrelated word paraphasias producing neologisms that by luck happened to be words. The patients sometimes find difficulty in finding the proper words producing anomia that underlies the neologism in a person with jargon aphasia. When patients get better they become anomic where the neologisms disappear but they are not easily replaced by the original words; as patient’s speech becomes dominated by anomia (Green 1969, p: 103).

A Paradigmatic substitution occurs between phonologically similar phonemes were such similarity increase the average number of substitutions; such as the substitution between /b/ and /p/ (Lecourse & Lhermitte’, 1979).

2.7.1.2 Paraphasias and Paralexias

Luria (1986) argues that finding a word involves the appearance of many additional links or things that are associated or similar to the given object. The word “animals” evokes words such as “bird, cat, dog, etc.” A word becomes a “central node” of a whole network of images which carries a certain connotation with the intended word, and when a person needs to use certain word, he/she will choose the immediate or denotative meaning. The semantic field used to find the intended word is a phenomenon called word finding difficulty WFD. Paralexia is related to paraphasia but occurs in the context of reading. Boccato (2018) argues that patients with paralexia find difficulty in finding the intended word so they might produce a word that carries semantic associations, for example; using the word “trip” instead of “journey”. Substitution occurs also in closed word classes, such as; pronoun “when” is substituted with “where”. Substitution sometimes occurs within phonological links such as substituting the word “horror” for “odor”.

2.7.2 Frameworks in Semantics

2.7.2.1 Tip of the tongue (TOT) Phenomenon

Patients sometimes know the intended word but at the same time they feel that the word does not come (Oliveira, 2017). According to Barton (1971) aphasic patients suffer from daily word finding difficulty but they are still able to recall generic information about the target word. Aphasic patients are able to recall the first letter but sometimes they are not able to recall the whole word. In a study conducted by Barton it was observed that the first letter was correct 62% which is almost similar to normal adults. For example:

Table (3): Patient's Questions and Answers

Researcher question	Patient's answer
What caused you the accident?	LB
What is the LB?	Big LB
Is it a vehicle for transporting goods?	Yes

The aphasic patient knows what he needs to describe, but he is unable to say the word so he tended to substitute the target word by using a socially known name for the vehicle "LB", when the researcher is unaware of the meaning of LB the aphasic patient described the target object; due to his inability to recall the whole word.

2.7.3 Frameworks of Agrammatism

Sufferers of Broca's aphasia usually produce short, grammatically incoherent sentences, and they omit complex words or verb inflections. Broca's aphasia suffers find difficulty in forming sentences as they are unable of involving fillers, connectors, or conjunctions. Semantic processing at the sentence level is connected to frontal and temporal brain regions in both hemispheres (Caplan & Waters & Alpert, 1998).

2.7.3.1 Mapping Hypothesis

According to Saffran, Shwartz, and Martin (1980) people who suffer from agrammatism are able to make judgments about the logicality of a complex sentence, such as; "The bird is chasing the cat". Agrammatic shows inability of mapping syntactic representations into semantic representations. The subject and object in the syntactic structure should be mapped to their thematic roles to provide a semantic representation. Thematic roles are defined as the relationship a noun phrase may have in relation to a verb, such as; patient, location, goal, theme, and agent.

According to a study conducted by Schwartz (1994) mapping hypothesis refers to the difficulty in mapping the meaning of a sentence along with the syntactic form of sentences. The choice of a certain word in a sentence entails two levels. The first level is the functional level which focuses on semantic features of a word. In the functional level thematic roles "who does what to whom" are determined. The second is the positional level in which syntactic and phonological features of a sentence are determined. Patients who suffer from agrammatism have difficulty mapping the functional level along with the positional level.

Caplan (1992) discussed three routes that come to play in sentence comprehension; the syntactic route, the lexico-inferential route, and the canonical-order route:

Syntactic route can be made easier in relation to parsing. Parsing is defined as the breakdown of a sentence into its parts so that the meaning of the sentence is understood. Using the sentence order N V N, and the use of a thematic noun such as; the agent, makes it easier for agrammatic person.

The canonical order route is defined as applying the linear order of nouns to identify their thematic roles. The nouns or noun phrases are mapped into thematic roles.

The lexico-inferential route works on selecting thematic roles to nouns taking into consideration the selection constraints of the verb without taking into account the syntactic structure. For example, in the following sentence; "the girl was eaten by bird" the syntactic structure will be as follows:

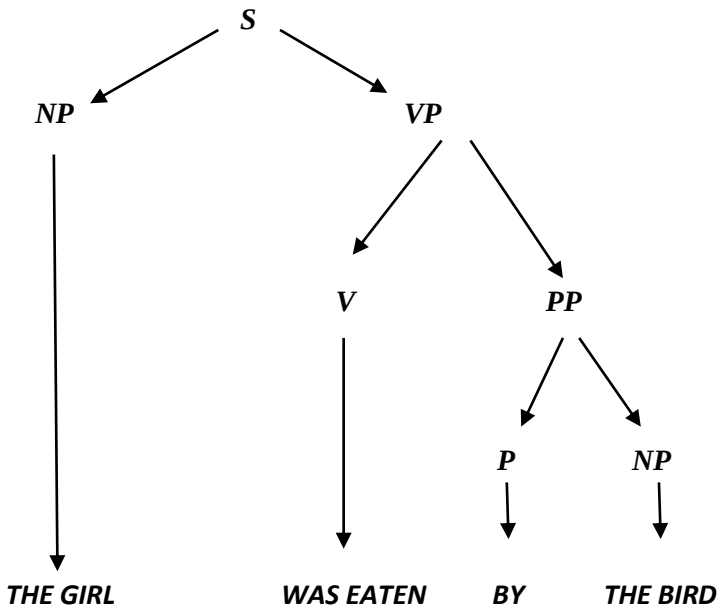


Figure (3): Syntactic structure of "*The girl was eaten by the bird"*

The previous sentence structure relates to the active sentence "the bird ate the girl" where the subject or the agent in the sentence is "the bird" and the object is "the girl", who is the patient.

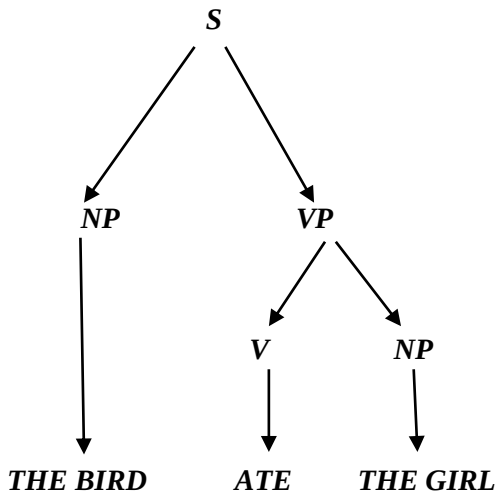


Figure (4): Syntactic Structure for the Active Sentence, The bird ate the girl

Applying **the canonical order route** means that the first NP will be the agent and the second NP will be the patient, such as; "the girl": agent, "the bird": patient.

The **lexico-inferential route** would make “the girl” the agent and “the bird” the patient as it would be semantically more logical that the girl would eat a bird rather than the bird eating a girl.

2.7.3.2 The Trace Deletion Hypothesis

Grodzinsky (1980) introduced the trace deletion hypothesis (TDH); which describes agrammatism as a type of disorder that affects the syntactic tree structure. The TDH argues that the disturbance affects *traces*, or the empty places left after the movement transformations are conducted. Transformation can be defined as the change of a basic syntactic structure to another structure. Sentence is structured by a basic form and some parts of the sentence are changed by the transformation. The parts of the sentence which were left behind are the traces left in a mental representation of the sentence form. Traces help in understanding the meaning of sentence; but when the traces are not present a passive sentence cannot be interpreted; as the thematic roles cannot be assigned for semantic interpretation. Names of objects are usually identified through the occipital lobe while verbs are identified in the frontal lobes motor cortex.

Novaes-Pinto (2012) argue that agrammatism produces “telegraphic speech” through producing nouns in order to describe a specific action; where the aphasic patients try to select the intended word from many other words that might assimilate the pronunciation of the intended word. Coudry (1988) also noticed that agrammatism patients are unable to use the plural morpheme /s/ in its correct place, as the morpheme was placed in other utterances, such as:

- **Question**: What are these girls doing? (The girls are riding horses)
- **The patient’s answer**: horse**s**

Agrammatic patients suffer from deficit in the use of proper tense rather than agreement morphemes. The tree- pruning hypothesis is used to depict the tense node that dominates the agreement node that is pruned. Agrammatic patient's speech does not include complementizer phrase which is needed to accommodate relative clauses (Pulvermuller, 1999).

According to Chomsky 1995 "syntactic tree content and function words are assigned different nodes. Functional nodes include inflectional nodes: an agreement phrase (AgrP) which involves agreement between subject and verb, gender and number, and tense phrase (TP) including tense inflection of the verb. Finite verbs move from their original position as V within a VP to Agr and then T in order to collect their inflection. The highest phrasal node in the tree is the complementizer phrase (CP) which includes elements such as "that" and "Who" morphemes: "where and what". The nodes are hierarchically ordered in the syntactic tree; the lowest node is the verb phrase and the highest node is (CP)" (p. 365).

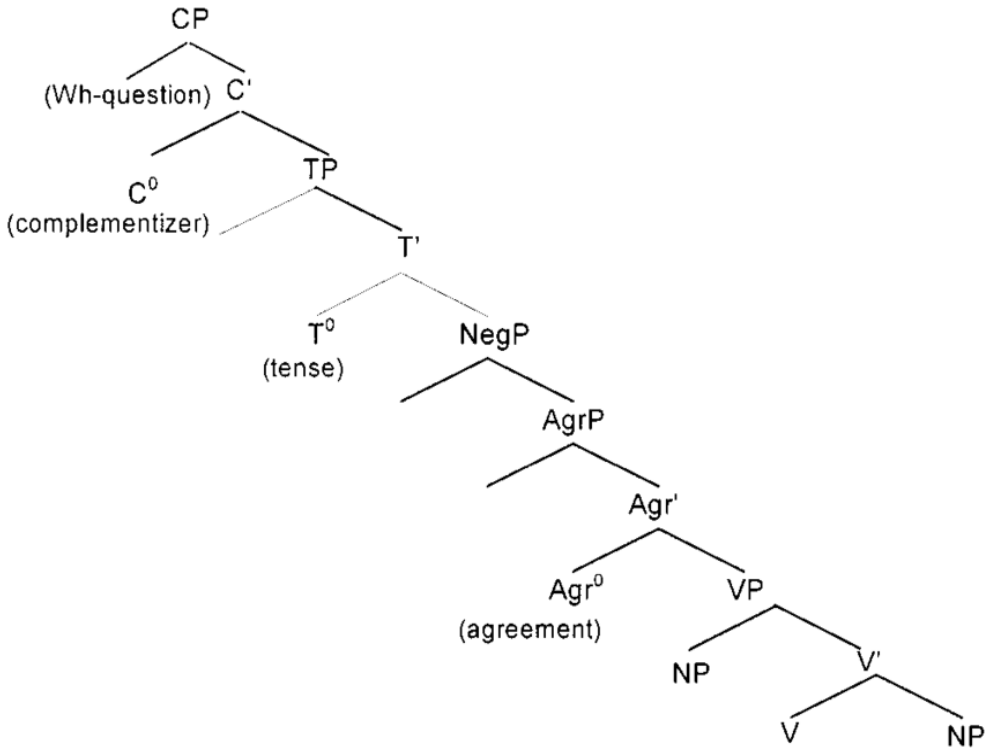


Figure (5): Syntactic Tree (Pollock, 1989)

2.7.3.3 The Adaptation Hypothesis

Agrammatism as a disorder varies in severity as it affects the activation of lexical items, since the simultaneous action between generations of syntactic slots and lexical items is disturbed. This deficit leads to more errors in paraphsias and pragrammatism. Agrammatism affects the *timing of activation* of sentence either by delaying or by quick activation. Agrammatism adaptation to timing deficit leads to three types of strategies (Kolk, 1998):

1- Simplification: this results in reduced variety of phrases; due the preventive adaptation. Aphasic patients are trained to choose shorter grammatical structures to provide them with more efficient communication.

2- Restart: fast activation by benefiting from the first attempt through the corrective adaptation.

3- Slow rate of speech.

2.7.4 Pragmatics

The frontal lobe manages activities such as; attention, working memory, mental flexibility, organization, planning, problem solving abilities, and initiation of activity. Sufferers of traumatic brain injury might suffer executive dysfunction. People who suffer right hemisphere damage will mostly have communication difficulties (Cummings, 2009). According to Prutting & Kirchner (1987) pragmatics encompasses the relationship between language and the context in which is being used taking into consideration sensitivity to social context.

Aphasic patients who suffer from severe left hemisphere lesion are usually affected in both the receptive “Wernicke’s area” and expressive “Broca’s area” in the brain. Aphasic patients are able to express their emotions through facial expressions and

intonations. The patient shows the following characteristics; cannot say any word, understanding is also difficult, cannot write, cannot read, and cannot repeat any words. The symptoms accompanied to the patient's brain damage can indicate that the patient suffers from global aphasia (Hanlon & Lux & Dromerick, 1999).

Epilepsy-aphasia condition causes impairment of language skills, such as; speaking, writing, and reading. Epilepsy-aphasia causes abnormal electrical activity in the brain which usually begins at childhood which results in difficulty understanding speech context which results in loss of concentration. Children who suffer from epilepsy-aphasia syndromes sometimes speak later than their peers as the electrical activity in the brain causes language skills impairment, loss of attention, and learning disabilities. People with epilepsy-aphasia disorders usually have family members with a condition in epilepsy or related disorders (Tsai & Turner, 2013).

According to Crosson (1992) aphasia can result in impaired comprehension of longer utterances and connected texts such as; difficulties in handling logico-grammatical structures, problems with metaphor interpretation, inference, abstraction in general, or decontextualization, and sometimes can result in difficulties in body communication. The term high-level language (HLL) is used to describe language problems that are semantic-pragmatic. HLL difficulties are mostly diagnosed in mild cases of aphasia.

Cummings (2010) argues that damage in right-hemisphere results in problems related to the use of language in context:

1- Left neglect is a reduced response of the left side which results in deficits in reading, writing, reduction in attention, and spatial orientation.

2- Prosodic deficit results in deficit in both comprehension and production. Prosodic deficits results in problems in understanding intonation and stress in utterances, people who suffer deficit in their right hemisphere face more difficulties in understanding semantic and contextual information.

3- Lexical-semantic deficit can result in deficit in comprehension, production of words, and the ability of producing longer utterances. A person with damage in right hemisphere will use more connotative words to describe a situation, as word finding difficulties and comprehension difficulties also affect the interactions ability of patients.

4- Emotional information deficit is present in right hemisphere damage as it affects both comprehension and production. Emotional information deficit not only affects facial expressions but it also affects verbal expression of emotions. Such deficit can also affect social relation due to the semantic problems.

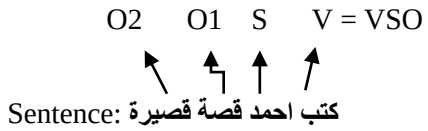
5- Discourse deficit occurs mostly with people who suffer right hemisphere damage which results in their inability of understanding complex communication. Inability of managing complex situations can affect the ability of managing all types of semantic-pragmatic situations, which can result in deficit in understanding humor and irony in communication.

2.8 Arabic Language Particular Components

Arabic grammar consists of two categories: *morphology and syntax*. Arabic language is an inflectional language and Arabic sentences are structured with words which might be (particle, noun, or a verb) (Al-Muhtaseb & Mellish, 1996):

1) Arabic language frequently uses the VSO "*verb-subject-object*" form:

- The following example illustrates the classification of Arabic as **VSO** language:



Transliteration: <kataba ahmad qisatan qaseratan"

Dictionary:"كتب"<kataba> =wrote

"احمد"<Ahmad>= Ahmad

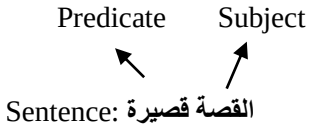
"قصة"<qisatan>= story

"قصيرة"<qasiratan> =short

Sentence translation: **Ahmad wrote a short story.**

- The following example illustrates the **nominal sentence with no verbs**:

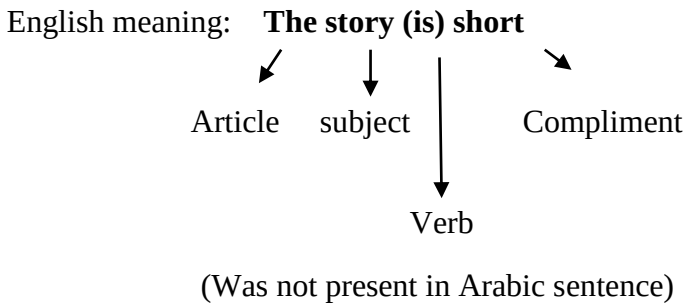
Arabic sentence can provide a complete meaning without the need of including a verb.



Transliteration: <al-qisatu qasiratun>

Dictionary: "القصة"<al-qisatu>=the story

"قصيرة"<qasiratun>= short



2) The following three examples illustrates the **Case ending** in the noun “Ahmad”:

- Sentence **حضر احمدٌ**:

  Transliteration: <hadara Ahmadun>

  English meaning: Ahmad came (or Ahmad (has) come).

  Dictionary: "حضر"<hadara>=came

  "احمد"<Ahmadun>=Ahmad

- Sentence: **أحضرتُ احمداً**

  Transliteration: <ahdartu ahmadan>

  English meaning: I brought Ahmad

  Dictionary: "احضرتُ"<ahdartu>=I brought

  "احمداً"<ahmadan>=Ahmad

- Sentence:**حضرتُ معَ احمدٍ**

  Transliteration: <hdartu ma’a Ahmadin>

  English meaning: I came with Ahmad

  Dictionary: "حضرتُ"<hdartu>= I came

  "معَ"<ma’a>=with

  "احمدٍ"<ahmadin>= Ahmad

The noun ‘ahmad’ "احمد" has occurred with three types of endings. The rules that govern the set-up of markers on verbs and nouns depend on the role and location of the nouns or verbs within a sentence. These types of endings are called:

- Regularity (nominative), such as "احمدٌ"
- Opening such as in "احمداً"
- Reduction (genitive) such as "احمدٍ"

3) The following examples depict the **word derivations:**

In the Arabic language a single word can derive many words with different meanings. From the base of a verb or noun many derivations can be derived; the following example shows some derivations that can be produced from the base of the word

“**اكلّ**”: which means eating.

اكلَ<akala> =food

يأكلُ<ya’kol> =he eats

ان يأكلُ<an yakul>=that he eats

أُكلًا<aklan>=food

ألأكالُ<al-aklu>=eating a lot

4) The following examples illustrates **personal pronouns** in Arabic language:

Personal pronouns might be third person, spoken to second person, or first person (the speaker). Personal pronouns or also called personal nouns can be prominent personal nouns, which are divided into two types: connected at the end of word or individually written. The other type is the latent personal nouns which are divided into obligatory latent or permissibly latent.

- The following example depicts the obligatory latent personal pronoun:

  Sentence: **أكُلُ طعامي**

  Transliteration: <akolu ta’ami>

  English translation: (i) eat my food

  Dictionary: "اكلُ"=I eat

  "طعامي" =my food

- In the following example depicts the absence of prominent feminine plural personal pronoun in regularity form:

  Sentence: **البناتُ يأكلنَ طعامهنّ**

  Transliteration: <al-banaatu ya’kulna ta’amahunna>

  English meaning: the girls eat their food.

  Dictionary: "البنات"<al-banaatu>=the girls

  "بأكلنَ"<ya’kulna>= they eat

  "طعامهنّ"<ta’amahunna>= their food

The <na> attached to the word <ya’kulna> denotes femininity and the attached <hunna> to the word <ta’amahunna> is the personal pronoun for the girls in the reduction type.

5) The following example demonstrates the **passive verbs** in the Arabic language:

Passive verb form entails no place for the agent; who can be attached to the passive sentence implicitly or in limited verbs it can be attached to the verb through language particle. The following example illustrates a passive sentence form:

Sentence: **كُتبت القصة**

Transliteration: <kutibat al-qisatu>

English meaning: the story was written

Dictionary: "كُتبت"<kutibat>= (it) was written

"القصةُ"< al-qisatu>= the story

The personal pronoun "هو"<huwa>is used for masculine verbs or nouns and correspond to the English “he, him, or it”. The personal pronoun "هي"<hiya> is used with feminine verbs or nouns and corresponds to the English “she, it”. In Arabic language has different personal nouns to denote nouns plural feminine and masculine forms.

6) The following example illustrate **singular, dual, and plural forms**:

The Arabic language has the dual form which is not available in English language. The dual form has its own rules regarding syntax and morphology. Agreement in numbers, verbs, and names must be taken into consideration in forming sentences.

The following words illustrate the dual form in Arabic language:

In the English language the word “engineer” is translated into Arabic as "مهندس"<muhandes>. The English plural form is “engineers” and the Arabic plural form is "مهندسين"<muhandesena> or "مهندسون"<muhansuna> for males and "مهندسات"<muhandisat> for females. And for two engineers is "مهندسان"<muhandisan> or "مهندسين"<muhandisayn> for males and "مهندستين"<muhandisatayn> or "مهندستان"<muhandisatan> for females.

2.9 Empirical Studies

Many empirical studies were conducted in an attempt to explore the effect of brain damage on speech. The reviewed empirical studies mainly examined the work of Elisabeth Ahlsen (2006). The studies analyzed the effect of brain damage on phonological, morphological, lexical semantics, semantics, and pragmatic contributions

in context from a neurolinguistic perspective. This section will be divided according to the main themes found in the reviewed studies.

2.9.1 Phonology in Aphasia

In a study conducted by Wardana, Ketut & Suparwa (2018) to depict the phonological aspects within the speech of non-fluent aphasic patients; it focuses on phonological errors in non-fluent speech output. The study depicted that phonological speech discrepancies depends on the severity of brain pathology and the affected language area within the brain. The study investigated the speech of three aphasic patients; the output of the interview and naming task depicted in their speech distortion of phonetic errors and substitution, deletion, omission, and metathesis errors. The patients tended to produce phoneme substitution with the closest features of the target.

The study entailed the following results for the three non-fluent aphasic patients:

Table (4): Distribution of Broca's Aphasic Errors

Broca's	KW	NS	MD
Phoneme substitution	65%	68%	71%
Metathesis	20%	20%	18%
Omission	5%	11%	10%
Addition	10%	1%	1%

The study revealed that the highest percentage of errors was the "phoneme substitution", and then the "metathesis", after that "omission" and the lowest percentage was the "phoneme addition".

According to Blumstein (1973) interviews with aphasic patients she depicted that Wernicke's aphasic deficits are produced due to their inability to access underlying phonological representation. Fluent aphasic patient's phonological deficit occurs due to impairment in constructing phonemic representations, while Broca's aphasics occur due

to phonetic disturbance. In Blumstein study non-fluent patients produce the highest percentage of phonological errors in “phoneme substitution”, then “phoneme omission”, after that “contextual errors”, and finally the “addition errors”. In the case of fluent aphasic patients the highest percentage of errors was classified same as the non-fluent patients errors classification.

Table (5): Aphasic Patient’s Phonological Errors

	Broca	**Wernicke**
Phoneme substitution	48.7%	35.2%
Omission	24.7%	30.3%
Contextual	20.0%	20.7%
Addition	6.6%	13.8%

According to Beeson & Rising (2010) conducted a study that included two women with persistent impairment of phonological processing following damage to the left perisylvian cortical regions. Phonological processing abilities were examined with tasks that required identification, maintenance, and manipulation of sub-lexical phonology. Participant 1 was impaired in all phonological tasks and scored 33.8%. Participant 2 had impairment in phoneme deletion and phoneme replacement task, and scored 75.4%. Both aphasic participants scored below the average composite of 95.1% by the control participants. The study observed that phonology involves the systematic ordering of phonemes, and the association between these phonemes produces semantic concepts that produce language. In language production process, a semantic representation activates first then the phonological level is activated; phonology is important for lexical retrieval. Brain injuries and stroke can produce phonologically impaired abilities which in turn results in inefficient language processing. Damage to the left perisylvian cortical areas results in deficit in phonological abilities which causes aphasia. People

suffering from aphasia have deficit in sound sequencing which results in producing phonemic paraphasias.

In a study conducted by Pirkko (1990) primarily concerned with single word phonological errors in aphasia; he depicted those phonemic errors entail substitution, deletion, addition, or transposition. The substitution errors are paradigmatic phoneme substitutions. In transposition (metathesis) errors two segments interchange. Phonemic deletion occurs when certain sounds or syllables are completely omitted from the word. Phonemic addition or sometimes referred to as duplication occurs when phonemes or syllables are duplicated within the word. Metathesis indicates the presence of phonological disorder. Metathesis occurs when two sounds or syllables are switched within a word, such as; “desk: decks”.

2.9.2 Syntax in Aphasia

Thompson (1995) conducted a research that included five monolingual aphasic patients and five normal subjects. The age of study sample ranges between 47 and 69; the data was collected through conversation between the aphasic patients and the five control group. The study found that aphasic patients were unable to access appropriately arguments around simple verbs, and could not produce complex verbs. The study explains the simple patterns of agrammatic speech of aphasic individuals. Aphasic patients are unable to access lexical properties of a particular verb due the complexity of verb and sentence variables. Aphasic patients choose shorter grammatical structures to provide more efficient communication. Patients suffering from aphasia might choose to speak using telegraphic speech or two try to produce complete sentence with usual aphasic problem. Agrammatism results in omission and substitution of grammatical morphemes and misconstruction of sentences and the adaptation to such simplified

speech results in considering it as a norm for the patients and to start using it among their peers rather than attempting to produce correct grammatical sentence format.

According to Shapiro, Caramazza, and Mottaghy (2001) nouns refers to names of objects and has the argument function; in neurolinguistic studies nouns have two aspects; comprehension of an image through spoken or written forms, and extensions of associated meanings that word refers to. Verbs describe an action and have predictive function; so it's considered to be more complex to name according to their classification. Verbs can be classified as action verbs "run", process verbs "deal with", "action process", state "want" and auxiliary verbs. Verbs syntactic analysis such as transitive verbs which needs a complement to complete meaning and intransitive verbs which do not need a complement to provide a complete meaning for a sentence; can affect the aphasic patients ability to name.

According to Caramazza, Cappelletti, and Shapiro (2008) researches conducted in the field of brain injury depicted that verb production is associated with the left frontal cortex, posterior frontal gyrus, peisylvian area and Broca's area. The production of nouns is associated with temporal lobes; the mid left fusiform gyrus and the mid right superior temporal gyrus. "The study revealed the association between naming and comprehension of nouns and verbs in the shared temporal and parietal regions. The results depicted overlapping regions for production and comprehension. The study also revealed that phonological recognition factor is associated with left posterior superior temporal gyrus, and posterior superior and inferior temporal gyri. The semantic factor is associated with left superior lateral occipital cortex, occipital fusiform gyrus, temporal occipital fusiform cortex, anterior inferior temporal gyrus, anterior temporal fusiform cortex, anterior middle temporal gyrus, temporal pole and precuneus. Performance of

the fluency is associated with left frontal and partial regions involving the anterior sub-marginal gyrus, center opercular cortex, pre-central gyri, post-central gyri, posterior parahippocampal gyrus, and the white matter tracts".

Damasio & Tranel (1993) observed that patient's inability of producing verbs within their speech is linked to neuroanatomical bases, as verbs are mainly produced in the left frontal lobe so any damage within this area will probably produce a deficit in producing verbs. Additional frontal regions were identified for verb naming and for verb comprehension but not for noun naming or noun comprehension, such as; left inferior frontal gyrus, medial frontal cortex, and frontal pole. Left hemisphere language areas produce nouns and verbs; as the nouns seems to be produced in the temporal lobe, and the verbs are retrieved from prefrontal areas. Patients suffering major damage in the left areas of brain show limited ability to speak in general weather nouns or verbs. The patient general symptoms might be: speech characteristics; difficulty in forming complete words, omission of pronouns, articles, impaired fluency, impaired repetition, impaired naming and the omission of conjunctions and focusing on saying only the main nouns and verbs.

2.9.3 Morphology in Aphasia

Badecker & Caramazza (1987) conducted a study that described nearly a hundred aphasic patients that suffer from deficit in processing grammatical morphemes; such as producing "walking" instead of "walked". The study depicted that morphological errors results due to deficit to sentence processing while single word processing remain unimpaired. Free standing grammatical morphemes were impaired and some other patients substituted or omitted free standing grammatical morphemes but the number of errors or omissions in function words was higher. The error types observed in patients

are morphological substitution, morphological insertion, and morphological deletion. The study also observed that relative frequency of an affixed word and its stem and the similarity between lexically related forms can result in patients producing some morphological errors in affixed words (affix omission and substitution). The study also observed that one of the patients produced a lot of illegal combinations of morphemes; such as: “poorest: poorless” and “youthful: youthly”.

Goodglass (1976) argues that agrammatism is described as producing short or incomplete sentences, or the substitution or deletion of words and morphemes. Agrammatism produces ungrammatical speech due to the loss of the class mental lexicon or the inability to fit the subject with free and bound morphemes. For many patients starting a speech with content word is found to be much easier than starting a speech with articles; so articles tend to be deleted from patient’s speech. Syllabic suffixes tend to be less pronounced by patients such as the plural suffix –s in “cats” while non-syllabic plural suffix –es such as “places” tend to preserved within the patient’s speech.

2.9.4 Lexical Semantics in Aphasia

In a study conducted by Butterworth, Howard and Mcloughlin (1984) a thirty aphasic patients where included to depict semantic deficit in auditory comprehension and naming task. The study observed that aphasic patient’s semantic errors lie in the word recognition which results in the production of phonologically similar word or a semantically related word. The study depicted that semantic deficit is mostly related to the severity of aphasia rather than the type of aphasia. On the other hand, Goodglass & Kaplan (1972) argue that semantic errors in speech production are depicted in Wernicke’s aphasic patients, but are rare in Broca’s aphasia patients.

Ahlsen (2006) discussed also the Difficulty in finding the target word is a common thing between people with aphasia and is known as “anomia”; which results in patient’s inability in naming objects. Patients suffering from hard time in finding the target word they will often try to find other words related to the target word. Patients when unable to recall the target word they will often replace it by a word that is semantically or phonologically related to it. Semantic related words that fall within these categories: same semantic category such as; cat for dog, superordinate such as; dog for poodle, subordinate, such as; poodle for dog , part of whole such as; head for body, attribute such as; green for grass, spatial relation such as; head for cap, and functional casual relation such as; dance for party.

2.9.5 Pragmatics

Avent & Wertz (1996) discussed the difference in pragmatics between adults with fluent aphasia and adults with non-fluent aphasia; through conducting a study that included twenty-seven individuals with aphasia. Using Prutting & Kirchner pragmatic protocol to analyze pragmatic speech through including; turn taking, topic initiation, topic maintenance, vocal quality, prosody, speech acts, facial expressions, gestural usage. Pragmatic aspects were analyzed for each participant and the results observed that adults with fluent aphasia produced higher level of pragmatic appropriateness compared to non fluent aphasic adults. Topic maintenance involves the ability to maintain a closely related topic for multiple speaking turns. Turn taking is the conversational turns that people reserve during conversation. Prosody is used to provide semantic information such as; short or long speech length, low or high pitch, timbre of voice, and soft or loud loudness. Speech acts is defined as the utterances that serves a function in communication, such as; greeting, complaint, refusal, invitation, and compliment.

Ojemann (1986) argues that patients who suffer from aphasia usually complain of memory impairment. Loss of memory is a reflection of the aphasic poor comprehension; “Memory and language can be disrupted by electrical stimulation of the left perisylvian cortex, associated white matter, or related thalamic structures, depicting a relationship between memory and language function” (p: 51). Loss of memory can be related to phonological system which retrieves and maintain verbal information and is also related to visuo-spatial sketchpad which saves visual and spatial information. A relationship is detected between working memory and the severity of aphasia, as the density of the posterior region of the left temporal gyrus predicts the efficiency of auditory verbal working memory and comprehension (Baddeley, 2000 & Hitch, 1974). The visuo-spatial tasks are associated with right hemisphere and a deficit in the short working memory depicts that the left hemisphere relates to the processing of visuo-spatial stimuli. Left hemisphere plays an important role in the acquired linguistic deficit and in working memory (Paulraj, 2018).

The previous studies observed that aphasic patients may only be able to retrieve partial information from words. Morphological disorder affects the word’s affixes, leading patients to find difficulty in retrieving inflectional affixes such as; mark plural and singular, third person singular, first person singular, and the verb tense. Phonological disorder is explained in terms of phonemes; errors can include substitution, omission, and sequence. Semantic disorder can take many forms depending on the severity of impairment. Substitution of similar words or attributes is common in aphasia. Prosody can be impaired in aphasia; syllables may be shortened or lengthened according to the patient’s abilities. Pragmatic disorder can affect the patient’s abilities to comprehend higher level discourse that relates to semantics and the possible meanings that a sentence or question may carry.

CHAPTER THREE
Methodology

3.0 Introduction

This study is a qualitative research, conducted using discourse analysis approaches. The theoretical approach discusses neurolinguistics, while the methodological approach follows a descriptive analytical method. The main focus of this study is the linguistic disorder caused by damage to the brain.

3.1 Research Methodology

This study follows two methods; descriptive and discourse analysis. Descriptive method will be applied to describe the linguistic features of the speech of aphasic patients. The content analysis is used to describe the linguistic features in the discourse. Data collection techniques used in this research will be carried out through the process of interviews, records of patient's speech abilities and medical records, to determine the effect of aphasia on linguistic features, such as; phonological, morphological, syntactic, semantic, and pragmatic features.

The study will be conducted in accordance with medical advisor to obtain medical feedback about patients who suffers traumatic brain injury and stroke. Notes will be taken to understand the relationship between language and cognitive functions.

3.2. Sample of the Study

For the purpose of achieving the objectives of the study, the researcher collected data from people who suffer from different types of brain damage. The sample of the study is provided through analyzing speech disorder caused by brain damage. Some information will be collected from previous researches and from current aphasia patients if available to provide a deeper knowledge about speech disorder caused by

brain damage. The collected data will be transcribed from its origins into written form. All the collected data were analyzed according to the theories mentioned above.

3.3. Participants

Seventeen participants with aphasia were selected from Amman –Jordan. Group age ranges from 5-70, the majority number of aphasic patients were monolingual Arabic speakers, except for four patients who speak English as an additional language. Patients had normal vision, hearing within normal limits. Patients showed different neurological disorders depending on the severity of brain damage. Participants suffered from brain damage at least three months before the participation in the study. The following are case studies of people who suffered brain damage due to different causes. The medical information included is copied from their medical records as registered in their medical files. In some cases, the amount of information provided through clinical files was detailed but in other cases it was quite brief. These are real cases except that the names of the patients and the care facilities have been hidden to protect the anonymity of the patient, practitioners, and care facilities. The provided cases are sufferers from brain damage which caused different effects to each patient depending on the location and severity of the damage that took place in the brain. Some damages resulted in deficit in cognition, memory, attention, or speech.

Participant's speech disorder was tested through two sets of behavioral probes; one for testing comprehension and the second one to test the ability of producing speech. Each participant was met along one or two sessions of free speech, young participants within school age were tested for reading and writing abilities. Participants were asked general questions in informal environment to monitor their ability of producing coherent and fluent speech in relaxed setting. Participants were given the needed time to respond,

both naming and sentence responses were recorded. Regardless the use of substitution, deletion, or pronouncing part of the target word by participants to answer the questions, a good amount of target answers was given by them.

- **The study includes the following patients:**

  1- Mohammed, a 47 years old male patient. Mohammed suffers from a stroke in the right side of the brain during April 2021. The injury caused the patient who was a monolingual Arabic speaker weakness in speech; characterized in his inability to use complex nouns and verbs. The patient's no longer uses conjunctions, and he focuses his speech on simple verbs in root structure. The patient has a medical history as follows; the onset of injury took place 1/04/2021, the patient had Corona Virus then he got a heart attack and stroke. The patient was also diagnosed with hypertension. The patient is on regular medication for heart attack and seizers- due to increase in brain electrical activity-. The patient was hospitalized for 14 days including one week in the ICU and had a cardiac catheterization surgery. The patient main problems are the weakness, pain, numbness in left upper and lower limbs, changes in sensation in left hand, balance problems, left side facial palsy, and poor postural alignment in sitting and walking. The therapist and speech language pathologist dealing with the patient apply strategies for treatment such as; neuro-rehabilitation models PNF, NDT, biomechanical approach, task oriented training, and sensory retraining. Other strategies for treatment are the motor learning; repetitive task-oriented training, mirror therapy, bilateral arm training (BAT), and modalities; TENS -low frequency due to his critical condition-. The patient evaluation of activity of daily living shows that the patient is independent in the feeding activity, while he needs physical assistance in dressing and toilet

hygiene. The interaction with the patient depicts many observations, linguistically; the patient is able to answer using simple words but capable of conveying the intended meaning, and his comprehension is mostly good but he relays on others to answer on his behalf rather than speaking immediately about his diagnosis. I would argue that the reason for relaying on other to answer is that he finds speaking "heavy" as described by the therapist before his session so speaking makes him uncomfortable. The patient suffers from difficulty in vision due to the damage in the right cerebral hemisphere. Right side brain damage caused the patient problems with concentration where he needs time to analyze the question directed from the researcher; to be able to answer. The damage also affected the patient's comprehension as he shows ability to answer simple question but unable to describe his actual medical case, where his son takes over and answers the question.

2- **Izz el Din, is** a 37 years old male patient. Izz el Din suffers from left side brain injury which caused him ability to pronounce only the first two or three letters from a word. Izz el Din is bilingual Arabic and English speaker and his mother tongue is Arabic; but he lost the ability in both languages. Izz el Din suffers from damage in the left side of the brain. The brain damage caused him inability to speak fluently as he needs to make hard effort to be able to speak. The patient is able to pronounce the first letters of a word, and he need to take a deep breath to be able to continue speaking the other letters. The patient suffers from damage in his right body side as he cannot walk with his right leg and has limited mobility with his right hand. The patient was hospitalized for five years and undergone several surgeries in the brain and conducted a platinum internal

fixation in his left hand. The patient is able to understand what other people say but struggles to speak as he speaks very slowly, omits words, struggles to get words out. The patient can understand what is written but cannot read it due to his deficit in the language production areas within the brain but is able to write normally. The patient's head injury caused him damage to the brain; a mild head injury can cause brain problems in the long term the patient's injury can vary between mild and severe as he still preserve most of his abilities. The patient's head injury caused him to go unconscious for more than a month.

3- **Fathie,** a 48 years old female patient. Fathie suffers from a stroke to the posterior right side of the brain which severely damaged the speech production area in the brain. The patient who was a monolingual Arabic speaker is no longer able to speak. Loss of speech caused her depression. The patient suffers from left side hemiplegia caused by brain stroke in 2019. In addition, the patient suffers from inability of moving right hand due to medical error during the insertion of the intravenous needle which caused her atrophy and weakness in hand muscles. The patient's occupational therapy assessment shows absence since Sep 2019; which indicates that the patient never attended any therapy sessions except for three times which were given at home rather than the institution. Damage to the right side of the brain caused her paralysis in most of her body abilities; the patient is unable to walk or move hands or stand up. The patient suffers from severe impairment in expressive and receptive skills. Aphasic patients who suffer from severe left hemisphere lesion are usually affected in both the receptive "Wernicke's area" and expressive "Broca's area" in the brain.

4- **Abeer,** a 22 years old female patient. Abeer suffers from acquired damage to the right side of the brain since she was 4 years old. The patient's injury caused her difficulty in producing certain phonological sounds such as the Arabic letters "ش"and "ج". Abeer is monolingual Arabic speaker and she is committed to the therapy which helped her to be the most fluent speaker interviewed among the post- brain damage patients. The patient suffers from right side head trauma due to RTA which caused left side hemisphere since she was 4 years old. Her 2006 physiotherapy assessment reveals that the patient's medical history started in 2001 after a car accident and going into coma for 30 days. The patient suffered from brain internal bleeding and bone fractures in many areas of her body, the patient did not undergo any surgery for brain. The patient latest occupational therapy assessment shows that the main problems are weakness in left body side, spasticity in the left side, pain in left side pelvic area due to spasticity and maladaptive forms of act performance. The patient is able to walk in straight line, is able to conduct all life activities independently except for her facing some difficulties in tying her hair, and difficulty in standing up after being seated.

5- **Aziza,** is a 65years old female patient. Aziza suffers from a stroke in the left side of the brain which caused her inability to produce a full lexicon and she is unable to add prefixes to verbs. Aziza is monolingual Arabic speaker. The patient needs to be assisted in life activities such as walking, eating, and dressing. The patient lost her ability to speak fluently and faces difficulty finding the words to express her thoughts. She can only say only few words which describe some of her daily major activities. Aziza did not accept to proceed with

pathological, occupational therapy and physiotherapy for personal circumstances. Aziza inability to follow up with therapy worsened her medical conditions and linguistic abilities; as she lately started finding difficulty in comprehending the intended meaning of conversations. The patient does not show any effort and she relays on her family to answer questions directed to her. Aziza speech consists of main nouns and verbs without including any connectors and conjunctions.

6- **Aishe,** a 70 years old female patient. Aishe suffers from brain left side stroke in 2009 which affected her ability to speak fluently. She can express herself using simple lexicons and through creating new neologisms as she faces difficulty in retrieving the words. The patient is a monolingual Arabic speaker. Aisha suffered from blood pressure which caused her a sudden stroke that caused internal bleeding in the left side of the brain. The patient was hospitalized and treated for the bleeding, and after being released from hospital she started feeling pressure which causes her difficulty in speaking and numbness in right side. The patient did not feel any improvement in speech since the stroke which took place in 2009, but she improved in her ability of moving her hand. The patient was treated by a qualified speech pathologist in Arabic but she continuously registers absence for her classes which caused her limited improvement in her speech abilities, as she is able to say words even though she is not pronouncing words correctly but she also finds difficulty in producing grammatically and coherently correct sentences. Aisha sentences does not pertain the correct structures of semantics, syntax, and verb argument structure processing.

7- **Tal'at,** a 40 years old male patient. Tal'at suffers from damage to the brain caused by non- treated meningitis. The patient is monolingual Arabic speaker and his speech consist mainly of; weakness in constructing correct noun and verb structure. The patient tends to be unable to use suffixes correctly to words and the usage of subjective pronouns to indicate singular verb. Tal'at at age of 10 he suffered from fever but he was not hospitalized so his treatment was delayed upon his family discretion. The patient later on suffered from hypoxia "lack of oxygen in blood circulation". Following that he was diagnosed with meningitis swelling "inflammation in the protective membrane covering the brain and the spinal cord".

8- **Nour,** a 5 years old female patient. Nour suffers from epilepsy in the Broca's area in the brain. The patient is monolingual Arabic speaker. Nour brain damage caused her deletion of the first letter in all lexicons in spoken and written language. She is only able to say the first letter in her name. Nour at 2 years old was diagnosed with increased epilepsy at the speech area in the brain. Nour's mother revealed that the family suffers from inherent epileptic seizures cases as Nour's two sisters and one brother all suffer from epileptic seizures but Nour never had epileptic seizers. Nour does not have any hearing problems. She was given medicine for brain increased electrical activity; for duration of one year then the family stopped the medicine upon the doctor prescription. According to the patient's mother description Nour suffers from difficulty of following up with other kids in the kindergarten as she needed years to learn pronounce her name correctly as to say "نور"instead of "ور".

9- **Ahmad,** a 53 years old male patient. Ahmad lost his ability in producing a grammatically correct phrase or sentence, as he finds difficulty in finding the target lexicons to express his thoughts. Ahmad is bilingual as he speaks English as a second language and has the Arabic as his mother tongue, but he suffers word finding difficulty in both languages. Ahmad was diagnosed with brain tumor located in the left side of the brain which caused him paralysis in the right side of his body. The patient is attending classes with speech pathologist in order to regain his speech abilities after being diagnosed with aphasia caused by the brain tumor.

10- **Khaled**, is a 16 years old male patient. Khaled is monolingual Arabic speaker. Khaled suffered from brain internal bleeding at age 4 due to falling down on his head, the injury caused aphasia and comprehension difficulties. The patient revealed that he fell down on his head when he was 4 years old which caused him brain internal bleeding in the right side of the brain. The patient did not undergo any medical surgery. The patient medical diagnosis shows that he suffers from slow comprehension and aphasia; according to Stanford examination his IQ was estimated 5±83 which falls within slow learning range. Khaled suffers also from visual and oral memory loss; his medical report also revealed that he suffers from behavioral disorder (extra activity, loss of focus, and distraction). The medical report recommendation included advice for enrolling him in speech therapy sessions. The therapist revealed that sometimes he speaks fluently and other times his speech is non-fluent; the reason is medically unknown.

11- Hassan is a 63 years old male patient. Hassan is monolingual Arabic speaker. The patient suffered from stroke in the back side of the left hemisphere in 2021. The stroke caused him fluent aphasia; he is able to speak fluently but his speech lack cohesion where he adds irrelevant information to the topic. Hassan did not undergo any surgery but he follows up with speech pathologist since the stroke. The patient speech shows that he suffers from poor comprehension where the speech is fluent but the meaning is impaired. He is able to recall from semantic memory correct answers for fixed usage phrases; as short phrases always go together

12- Zahra is a 26 years old female patient. Zahra is bilingual in Arabic and English languages. The patient suffered from car accident in 2020 which caused her internal bleeding in the left side of the brain. The patient injury caused her non-fluent speech and mild paralysis in the right side of her body. Zahra attends speech therapy classes since two month after the accident and according to her therapist she is improving dramatically comparing to her first class. Zahra speech lacks connectors, conjunctions, prepositions she mainly build her sentences from function words. Zahra suffers from continuous headache and stiffness in her body but her comprehension is intact.

13- Fathie is a 60 years old female patient. Fathie is monolingual Arabic speaker. The patient suffered from left side brain stroke in 2022, which caused her paralysis in her right side of the body. According to her therapist her medical history includes high blood pressure and she suffers from diabetes. The patient was hospitalized for one week but she did not undergo any surgery. The patient is currently suffering from temporary non-fluent aphasia but she is recovering

dramatically and according to her therapist she might recover from 50% of paralysis within the first six months but her speech might need more time. The patient is currently suffering from inability to produce complex words or sentences. Her speech focuses mainly on function words and she is suffering from difficulty in producing words where she knows the information but she cannot pronounce it.

14- Naser is a 62 years old male patient. Naser is bilingual in Arabic and English language. The patient suffered in 2020 from a left side brain stroke which caused him back then incomplete loss of speech and movement but after two years of scheduled therapy he is able to produce simple sentences but he suffers from some agreement problems in plurality and numbers. The patient cannot be imposed to any kind of noises and if someone needs to speak to him he/she needs to use a very low tone of voice. The patient after the stroke suffers from continuous increase in body temperature and cannot cover his head at all due to continuous severe pain.

15- Talal is a 44 years old male patient. Talal is a monolingual Arabic speaker. The patient had an accident in 2021 which caused him internal bleeding into the right side of the brain and 12 bone fractures in different parts of the body. The patient suffered from severe injuries in right leg and an implantation surgery was conducted, and he suffers from weakness in his left side of the body so he uses wheel chair for movement. Talat is fluent aphasic; as he can speak fluently but after the few words he loses track with the actual subject and he starts saying unrelated issues. His speech lacks coherence and he substitute some words with other similar words.

16- Yousef is a 60 years old male patient. Yousef is monolingual Arabic speaker. The patient suffered from left side brain stroke in 2019 which caused him difficulty in speech. The patient's medical history involves diseases such as; diabetes and blood pressure. The patient did not improve since the stroke. The patient was hospitalized for ten days but no surgical intervention was required. The patient attends therapy classes since the stroke but his speech did not improve.

17- Hamzeh is 52 years old male patient. Hamzeh is monolingual Arabic speaker. The patient suffered left side brain stroke three months ago. The patient was not suffering from any medical history. The brain stroke caused him poor comprehension and affected his ability to speak as he cannot produce speech even if he feels that he knows the words.

CHAPTER FOUR
Findings of the Study

4.0 Introduction

This chapter presents the findings for the question that is set forth by the researcher. The question is:

- What are the linguistic disorders caused by neurological brain damage?

4.1 Data Analysis

First, the researcher identified the linguistic disorders that were commonly associated with brain damage by previous researchers. According to these types of disorders, the speech of seventeen aphasic patients was analyzed and discussed.

4.1.1 Findings of the Study

The researcher prepared few general questions for the patients who suffer from different types of brain damage. The questions were chosen to collect data about patient's comprehension and speech deficit acquired due to damage to certain areas of the brain. On the purpose of comparing the severity of damage with the linguistic features lost for each patient within the study, tables were prepared by the researcher.

Table (6): Biographic Information on the Patients

Name	Gender	Language	Age at onset (years)	Lesion site	Time post onset (years/month)
Ahmad	*Male*	*Arabic/English*	*53*	*Left side brain stroke*	*3 month*
Izz el Din	*Male*	*Arabic/English*	*30*	*Left side brain damage*	*7 years*
Aishe	*Female*	*Arabic*	*57*	*Left side brain stroke*	*13 years*
Azizeh	*Female*	*Arabic*	*63*	*Left side brain stroke*	*2 years*
Nour	*Female*	*Arabic*	*2*	*Left articulation area*	*3 years*
Tal'at	*Male*	*Arabic*	*10*	*Meningitis*	*30 years*
Mohammed	*Male*	*Arabic*	*47*	*Right side brain stroke*	*1 year*
Fathie	*Female*	*Arabic*	*46*	*Right side brain stroke*	*2 years*
Khaled	*Male*	*Arabic*	*4*	*Right side brain damage*	*12 years*
Abeer	*Female*	*Arabic*	*4*	*Right side brain damage*	*18 years*
Hassan	*Male*	*Arabic*	*63*	*Posterior left side brain stroke*	*5 month*
Naser	*Male*	*Arabic/English*	*59*	*Left side brain stroke*	*2 years*
Fathie 2	*Female*	*Arabic*	*60*	*Left side brain stroke*	*3 month*
Zahra	*Female*	*Arabic/English*	*24*	*Left side brain damage*	*2 years*
Talal	*Male*	*Arabic*	*43*	*Right side brain damage*	*1 year*
Yousef	*Male*	*Arabic*	*56*	*Left side brain stroke*	*4 years*
Hamzeh	*Male*	*Arabic*	*52*	*Left side brain stroke*	*3 months*

Table (7): Participant Diagnostic Information

Participant	***Type of stroke***	***Clinical diagnosis of aphasia***
Ahmad	*ischaemic*	*non fluent*
Aishe	*ischaemic*	*non fluent phonemicParaphasias*
Izz el Din	*hemorrhagic*	*non fluent*
Nour	*epiliptic*	*Broca's*
Azizeh	*ischaemic*	*non fluent*
Fathie 1	*ischaemic*	*global*
Abeer	*Hemorrhagic*	*fluent with deficit*
Mohammed	*ischaemic*	*non fluent*
Tal'at	*meningitis*	*fluent with grammatical defici*
Khaled	*Hemorrhagic*	*Fluent/ Non fluent*
Hassan	*ischaemic*	*Non fluent*
Zahra	*ischaemic*	*Fluent*
Naser	*ischaemic*	*Non fluent*
Fathie 2	*ischaemic*	*Non fluent*
Talal	*Hemorrhagic*	*Fluent*
Yosef	*ischaemic*	*Non fluent*
Hamzeh	*ischaemic*	*Non-fluent*

4.1.1.1 Findings Regarding Phonology

Patient's speech was analyzed using generative phonology to depict the neologisms created from speech errors, such as; substitution, omission, addition, and metathesis. The tests were in the form of spontaneous speech and answering questions.

a) Phonological Substitution

Phonological substitution is also called literal paraphasia, it describes a sound substitution or similar rearrangement of sound while keeping at least half of the original word sounds. Phonological substitution can create new terms that distort the original word and produce a neologism.

Phonological substitution appeared in the word "حضران"<hadaran> *instead of* <khadaran> "خضران" in Aishe's case.

In Talal's case phonological substitution occurred in the word "طيارة" <tiarah> *instead of* "سيارة"<siarah> thru substituting the sound /s/ with the sound /t/.

Phonological substitution occurred in Nour's case in the first sound of the following words; "امسة"<amseh> *instead of* <khamseh>"خمسة", and "المى" <alma> *instead of* <salma>"سلمى" .

In Zahra's case; the substitution occurred in the phoneme /s/ with /th/ in the word "ثيارة " <thiarah> instead of "سيارة" <siarah>. The /s/ phoneme in Arabic is a sibilant letter which is hard for aphasic patients to pronounce; so they usually tend to substitute it with other sounds such as; the sound /th/. In Zahra's case she substitutes the sound /s/ by the sound /th/ because of her injury the movement of her jaw became slightly impaired, which resulted in the flow of the air from both sides of the tongue when attempting to pronounce the /s/ so a sound /th/ is produced instead. Substitution also occurred in Khaled's case, as he substituted the word "راسي" <rasi> with the word

"هياسي"<hyasi> and he produced the word "ذكاهية" <zakahie> *instead of* "ذاكرة" <zakira>. In khaled's case the substitution produced a non-word error as the produced words do not exist and do not carry a meaning in it.

In Hassan's case substitution occurred in the word "اصهابي"<as**h**abi> *instead of* "اصحابي" < ashabi>, and in the word "بهبك" <ba**h**ibk> *instead of* "بحبك"<bahibk>.

Phonological substitution occurred also in Fathie's "2" case in the word "تقعت" <taqa'at> *instead of* "وقعت" < waqa'at>.

b) Phonological Omission

Phonological omission appeared in the following words; (3) Times in the case of Nour where she omitted the following sounds; "نات"< nat>*instead of* "بنات"<banat>, "واد"<wad>*instead of* "اولاد"<awlad>, "بيبي "< bibi>*instead of* "حبيبي"<habibi>.

Phonological omission occurred (2) Times in the case of Aishe where she omitted the following sounds; "نعش" <na'ash> *instead of* "طنعش" <tna'ash> in colloquial Arabic which is "اثنا عشر" <ithna-'ashr> in the standard Arabic.

Phonological omission appeared (1) time in Tala't's case in the following word; "عى" <'a> *instead of* "على"<'ala>.

Phonological omission occurred in the word "في" <fi> instead of "فيكم" <fikom> And he also omitted the feminine marker from the word "بلعب" <bal'ab> while he was describing the girl in the picture, so according to the Arabic morphology the verb takes gender marker producing the word "بتلعب" <btel'ab> in its colloquial form and in standard Arabic will be "تلعب" <tel'ab> for feminine gender while "يلعب" <yal'ab> will be used for describing an action conducted by a male.

Phonological omission occurred in Izz el Din case (4) times in the following words; "راك"< rak> *instead of*"راكب"<rakeb>, "تلف" < *tel*> *instead of* "تلفون" <telephone> "كمبيو" <*compu*> *instead of* "كمبيوتر" <computer>, and "خفي"<*khafi*> *instead of*"خفيف"<khafif>.

Phonological omission occurred (2) times in Zahra's case in the word "بيدا" <bida> where the target word is the colloquial word "بيدايقني" <bidayeqni> which can be translated in English as; "disturbs me". Omission occurred also in the word "لب" <lab>where in fact the target word is "يلعب" <biel'ab>.

c) Phonological Addition

Phonological addition appeared in the following word; "ابرات" <ibrat> *instead of* "ابر"<ibr>, and another time in the word "بنمشي" <bnimshi> *instead of* "بمشي" <bamshi> in Tal'at case.

Phonological addition occurred in Fathie's 2 case, where she duplicated the letter "ح"in the word "حفيدي"<hafidi> producing the word "حفحيدي"<hafhidi> which can be translated in English as "grandson" and in phonological addition the produced word would be equivalent to "**g**rand**g**son".

d) Phonological Metathesis

Phonological metathesis occurs when two sounds are reversed within a word. Phonological metathesis appeared in left side brain damage sufferers speech (1) time, in the reverse of first sound in Nour's case in the following word; "ددرس" <dadros> instead of "بدرس" <badros>.

In Hassan's case he switched the places of two sounds within the word "مسبوطين" <masbutin> instead of "مبسوطين"<mabsutin>which can be translated in English as "they are content" and in the patient's case he switched the letters as follows "they are

cnotent". Furthermore, he switched the letters in the following word "عشطان" <'ashtan>and the correct target word is "عطشان"<'atshan>, the patient's produced word can be translated as "thristy" for illustration purpose. The correct word format not achieved by the patient is "thirsty".

Table (8): Aphasic Errors for 17 Aphasic Patients.

	Non-Fluent	Fluent
Substitution	40.4%	37.5%
Omission	53.3%	37.5%
Addition	5.2%	25%
Metathesis	5.2%	25%

The spontaneous speech of fluent aphasic patients recorded the following order of phonological aphasic errors: substitution=omission> addition=metathesis. While in the non-fluent aphasic patients the spontaneous speech depicted the following order for phonological errors: omission>substitution>addition=metathesis. The overall number of phonological errors conducted by non-fluent aphasic patients was higher in the substitution and omission phonological errors, while; the fluent aphasic patients recorded higher addition and metathesis errors.

4.1.1.2 Findings Regarding Morphology

Agrammatism is defined as the deletion of grammatical inflections and function words. The patients were tending to use more simple words rather than complex words. Simple words tend to be sometimes substituted with much simpler form through omitting prefixes and suffixes to fit the patients' ability to express their needs.

a) Functional Morphemes

People who suffer from Broca's aphasia are unable of producing functional morphemes which constitute of conjunctions "*but, and, or, nor*", prepositions "*from, at,*

on, in, above", articles "*the, a, an*", and auxiliary verbs "*can, must, am*", and pronouns "*he, she her, we, that, these*".

Patients limited variation of functional morphemes within their speech, is observed among the non-fluent left side brain damage sufferers. Some common functional morphemes can be depicted in aphasic patients' speech. For instance, Ahmad used the functional morpheme "في" which is translated as "in". And Nour used the functional morpheme "و" which is translated in English as "and". Tala'at also used the functional morpheme "و"which is equivalent to "and". Among the patients who suffer from right side brain damage Mohammed used two types of functional morpheme within his speech such as "في, بي" which both denote in English the same meaning "in". Meanwhile, patient Abeer was able to produce a wider variety of functional morphemes such as; "ال, من, انا, و, على" which can be translated in English as follows "the, from, and, on".

- The previous examples show that patients are able to produce some functional morphemes, but in most cases, patients tend to omit all functional morphemes such as:

- السؤال: **اوصفيلي الصورة**
- فتحية 2: **ولد...طابة**
- **Transliteration: <walad…tabeh>**

Translation:

- Question: **describe the picture**

- Fathie 2: **boy…ball**

Here the patient omitted all functional morphemes; the speech consisted only of content words <walad> "ولد"and "طابة"<tabeh>.

- In another question the same patient was requested to describe another picture and same she omitted function morphemes; as she used only content words:

- السؤال: **اوصيفيلي الصورة الثانية**
- فتحية 2: **بنت...صغيرة...بت...**

Transliteration: <bint…sghire…bt>

- Question: **describe the other picture**
- Fathie 2: **girl…little...cr…**

In the previous example the patient omitted all functional morpheme and included only content words "بنت"and "صغيرة". The patient aimed at describing the action that the little girl is doing but she could not spell the word “crying”.

b) Free Morphemes

Free morphemes are the words that can form a complete meaning independently, such as; “cat, *girl, boy, and school*”.

Free morphemes is mostly used by aphasic patients to describe a situation or express feelings; but some words were being slightly impaired; as illustrated in the following table which represents the free morphemes produced by the patients along with the appropriate format of the target word.

Table (9): Free Morpheme Production Errors for Non-Fluent Patients

Participant	Produced word	Appropriate word	Morphological error
Aishe	نعش حضران حاف	اثنا عشر خضران اللحاف	*Omission* *Substitution* *Omission*
Izz el Din	تلف كمبيو	تلفون كمبيوتر	*Omission* *Omission*
Nour	المى	سلمى	*Substitution*
Zahra	ثيارة	سيارة	*Substitution*
Khaled	نكاهيه هياسي	ذاكرة راسي	*Non-word error* *Non-word error*

It can be observed from Table (9) that non-fluent aphasic participants suffer from morphological impairment at the words level; most of the words produced by the participants had impairment ranging from mild to severe within the word structure.

Table (10): Free Morpheme Production for Fluent Patients

Participant	Produced word	Appropriate word	Morphological error
Tal'at	ابرات	ابر	*Illegal combination*
Talal	لب	بلعب	*Omission*

It can be observed from table (10) that fluent aphasic participants are less impaired in morphological production, but yet they suffer impairment in word's affixes, such as; singular and plural and derivational affixes that marks the words as nouns, verbs, or adjectives.

c) Bound Morphemes

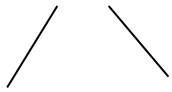
Bound morphemes are defined as the lexical items such as; "*-un, -s, -ed*" that need to be connected to other morphemes in order to produce a meaningful word. Patients suffering from aphasia find difficulty in producing correct tense agreement markers "-ed and –s". The omission of bound morphemes occurs frequently due to the stems which function as independent word.

In case (7) the patient could not use correct plurality form as he substituted the word "ابر"<ibr> which denotes plurality with another neologism "ابرات"<ibrat>in the following example:

Plural noun **Plural number**

With incorrect form

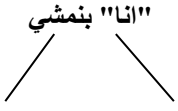
The previous form used by the patient entails plural number and an incorrect plural form for the word "ابرات". The English translation would be simply “six needles” but in Arabic language some words follow certain plurality rules. The correct number agreement form would be:



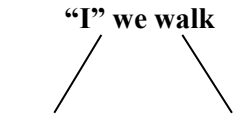
Correct plural form **Plural number**

The word "ابرة"<ibreh> which is translated in English as “needle” cannot be pluralized in the form "ابرات"<ibrat> as it follows broken plurals rules so it’s correct plural form will be "إبر" <ibr>.

The patient faced the plurality deficit also in the words "نعرج" <no’roj> and "نمشي" <nimshi> which are derived from the root "عرج"<’araja> and "مشى"<masha> and instead of forming the present verbs "بعرج"<ba’roj> and "بمشي"<bamshi> he substitute it with plural form.



Plural form **implicit pronoun “I”**



The patient used a plural present verb form to describe an action conducted by him and as a result he produced an incorrect subject verb agreement; as the correct form would be “I walk” "انا أمشي".

In case (5) the patient omitted the colloquial "ب" which is an Arabic preposition; the patient used the form "نام-اصحى" without any bound morphemes.

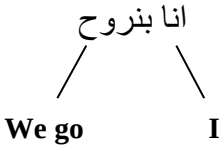
In the following example, the patient could not produce correct verb agreement:

- السؤال: **شو بتعمل بوقت الفراغ**
- ناصر: **انا بنروح**
- **Transliteration: <ana binruh>**

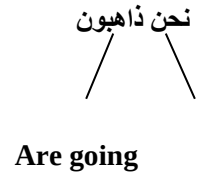
Question**: what do you do at your free time?**

Naser: I **“we go”**

In the previous example from the patient’s spontaneous speech revealed two morphological errors within the sentence where he used a single pronoun to describe an action conducted by more than one person:



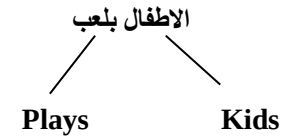
The word "بنروح"<binruh> is a colloquial form that denoted plurality in present tense verb, in standard Arabic the format of the sentence would be:



If the speaker intended to speak about two people, then he would use duality; which is unavailable in the English standard forms, but in translation it will take the plurality form:

The aphasic patient could not produce any of the agreements previously mentioned but instead he used single pronoun “I” with a plural present verb form.

The patient in the continuum of the same sentence he produced the following form:



The patient added a plural subject and a single subject agreement present verb. The colloquial form "بلعب" <bil’ab> it’s the subject “he” as is a single masculine verb agreement, to transform the verb into plural colloquial form then the following form would be used "بلعبوا"<bil’abu>. The standard Arabic form will be "الأطفال يلعبون"<al-atfal yal’abun>.

4.1.1.3 Findings Regarding Syntax

Testing syntax included an interview to observe sentence completion and grammatical judgment task. The interview intended to depict spontaneous speech from patients, through asking questions about the patient’s identity, stroke, therapy, and daily

life activities. Questions directed to patients were simple, limited in verbs, and the researcher used the same colloquial accent that the patients use in order to simplify the task. Aphasic patients' answers were compared to common answers of a healthy person. The patient's speech is Arabic and will be translated literally into English for analytical purposes.

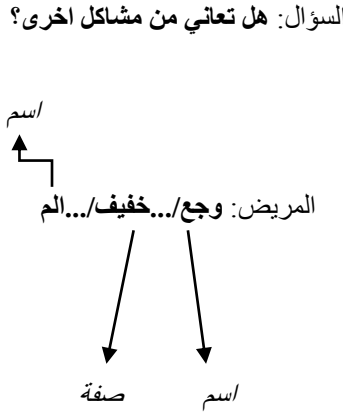
Table (11): Frequent Question for Research Aphasic Patients

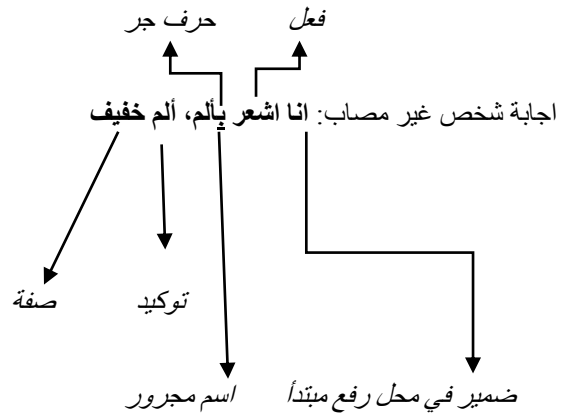
Number	***Translated questions***
1	*How do you feel today?*
2	*would you tell me what happened with you*?
3	*Are you following up with pathologist?*
4	*Do you keep up with therapy?*
5	*What is disturbing you the most after the stroke/injury?*

a) Agrammatic Speech

Agrammatic speech refers to the speech that lacks grammatical structure and close class items such as; determiners and inflections resulting in single word or short phrase utterances. In the following sentence is an observation about patient's agrammatic speech:

Case (1) the patient is attempting to answer the question in sentence form but he is unable to connect the single words with connectors to create a grammatically correct sentence.

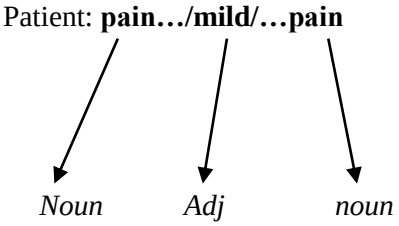




In the Arabic language there is a difference between the sentence produced by the patient and the one produced by the healthy person. The patient's actual answer contains (2) nouns and (1) adjective; while the healthy person answer contains (1) pronoun, (1) verb, (2) noun, (1) adjective, and (1) preposition.

LITERAL TRANSLATION:

Researcher: **do you suffer from anything else?**



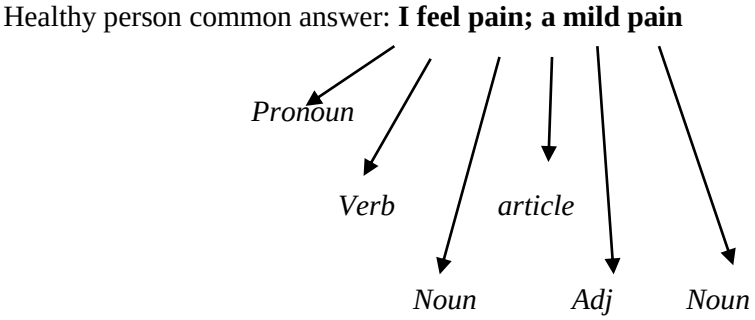


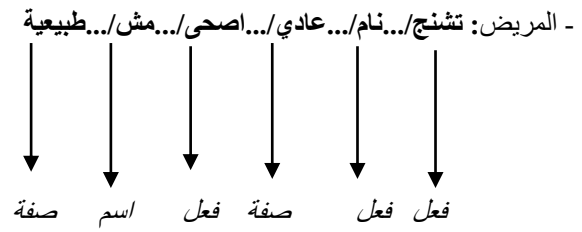
Table (12): Actual Patients Answer vs. Healthy Person Answer

Participant	Nouns	Verbs	Pro/pre/art	Adj/adv	Total	Variation
Patient	2	0	*None*	1	3	< 7:3
Healthy person	2	1	2	2	7	>

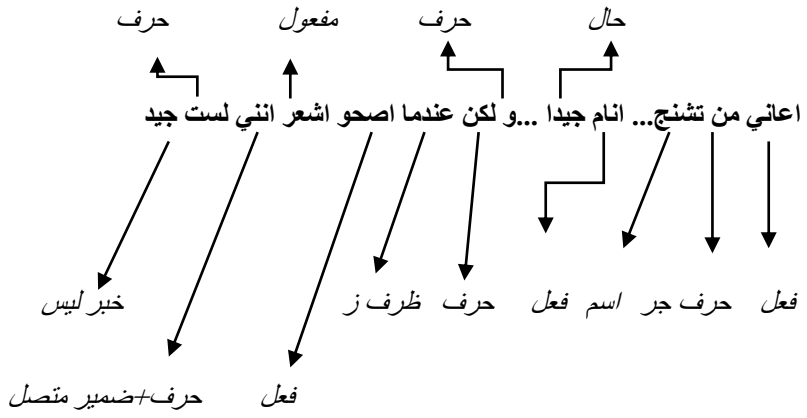
Table (12) depicts the following results; the aphasic participant was able to produce (2) nouns and (1) adjective without including any pronoun, connector, or article, but he repeated the word "pain" to emphasize on the main idea of the sentence. In the common format of a healthy person the sentence included (1) pronoun, (1) verb, (1) article, (1) adjective, and (2) noun. In the actual answer the total number of morphemes used is (3) while in the common answer of a healthy person the number of produced morphemes is (6).

In case (5) the patient is putting a great effort to produce speech but she finally manages to say few simple words while omitting connectors, articles, or pronoun.

السؤال: **شو بتشعري بعد الاصابة؟**



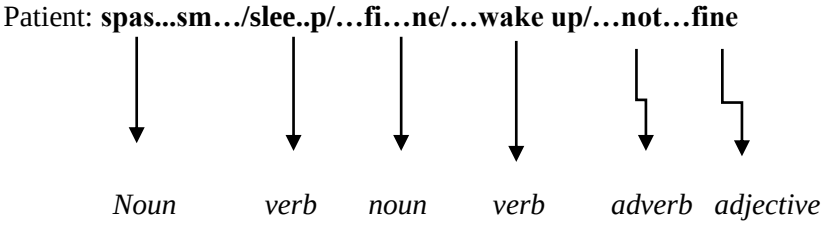
- اجابة شخص غير مصاب:



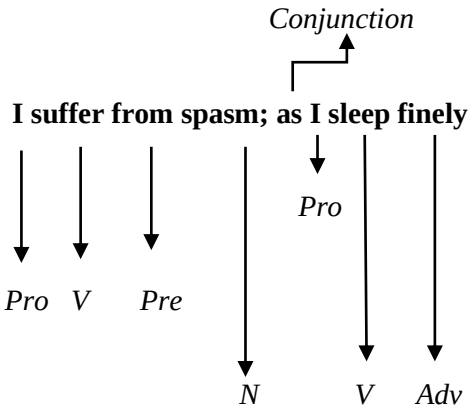
In the Arabic language there is a difference between the sentence produced by the patient and the one produced by the healthy person. The patient's actual answer includes (2) nouns and (1) adjective, and (3) verbs; while the healthy person answer contains (1) implied pronoun, (4) verb, (3) conjunction, (1) adjective, (1) conjunctive, (2) objective pronoun, (1) preposition, and (1) preposition.

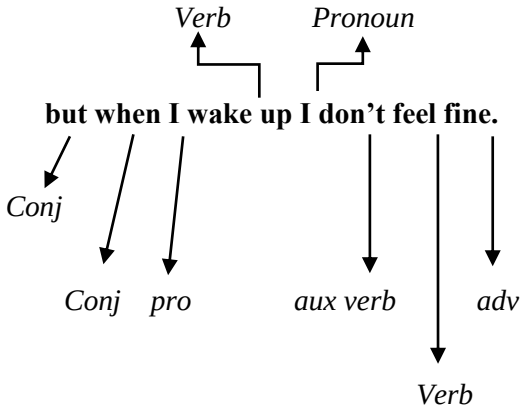
LITERAL TRANSLATION:

Researcher: how do you feel after the stroke?



Healthy person common answer:





The patient used mainly nouns and verbs and spontaneously omitted the adverbs, conjunctions and the morphological suffixes such as "-ly" for pronouns, as observed the patient used the words in its root form. The patient's actual answer produced (2) nouns, (2) verbs, (1) adjective and (1) adverbial, while the compared answer for a healthy patient produced (3) conjunctions, (3) pronouns, (1) preposition, (2) adverbs, (1) noun, and (5) verbs. In the actual answer the total of morphemes used is (5) while in the common answer of a healthy person the number of produced morphemes is (15).

Table (13): Actual Patients Answer vs. Healthy Person Answer

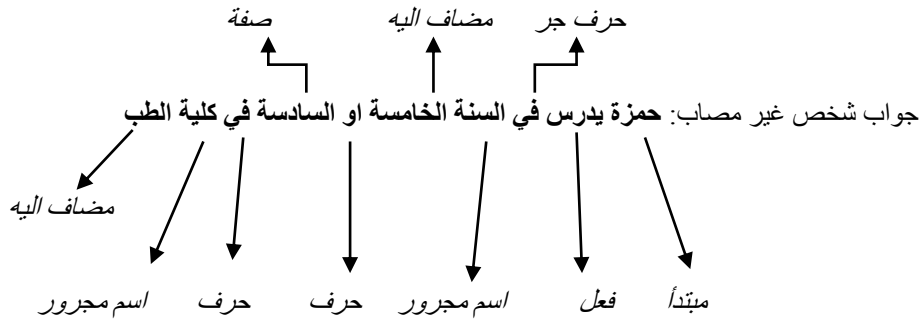
Participant	Nouns	Verbs	Pro/Pre/Art	Adj/Adv	Total	Variation
Patient	2	2	*None*	2	6	< 15:6 >
Healthy person	1	5	7	2	15	

In the previous table (13), it can be observed that the patient's answer consist of two nouns, two verbs, and two adjectives; while, the healthy participant answer was more detailed and included a wider variety of function and content words. The previous table depicts the difference in the ability of forming a complete grammatical structure sentences between healthy and aphasic participants.

In case (9) the patient is trying his best to produce a sentence but he suffers from non-fluent aphasia which caused him difficulty in producing a grammatically correct sentence.

- السؤال: اخبرني عن ابنك الكبير؟
- المريض: **حمزة/...سنة/...سادسة/...طب**

اسم *صفة* *اسم* *اسم*



In the Arabic language, there is a difference between the sentence produced by the patient and the one produced by the healthy person. The patient's actual answer obtains (3) nouns and (1) adjective; while the healthy person answer obtains (1) verb, (6) noun, (1) adjective, and (3) prepositions.

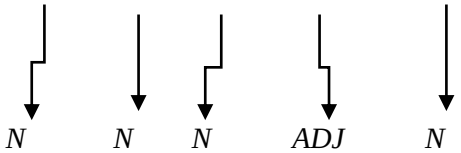
Table (14): Actual Patients Answer vs. Healthy Person Answer

Participant	Nouns	Verbs	Pro/Pre/Art	Adj/Adv	Total	Variation
Patient	1	*none*	*None*	1	2	< 6:2
Healthy person	2	1	2	1	6	>

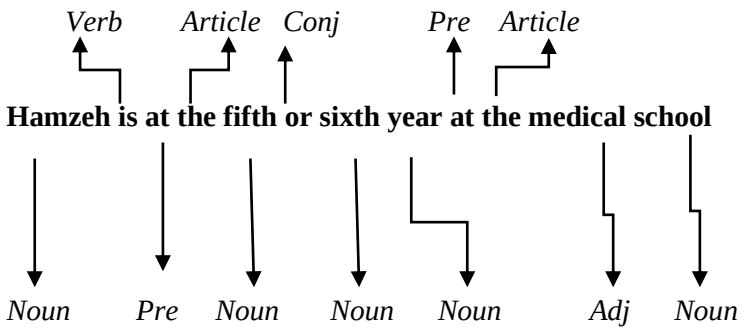
In table (14) it can be observed that the patient answer consisted of only one noun and one adjective; while, the healthy participant answer was more detailed and included a wider variety of function and content words.

- Therapist: tell me about your oldest son?

Patient: **Hamze…/five year…/sixth…/medical**



- Healthy person common answer:



The patient's speech tend to be simple and short; he focuses on the content words and omits any prepositions, articles, conjunctions. In the patient's actual answer it can be observed that he used (4) nouns and (1) adjective. While the healthy person most common answer included; (1) verb, (2) articles, (5) nouns, (1) adjective, (2) prepositions, and (1) conjunction. In the actual answer the total of morphemes used is (5) while in the common answer of a healthy person the number of produced morphemes is (12).

Table (15): Actual Patients Answer vs. Healthy Person Answer

Participant	Nouns	Verbs	Pro/pre/art	Adj/Adv	Total	Variation
Patient	4	*none*	*None*	1	5	< 12:5
Healthy person	5	1	5	1	12	>

Table (15) observed that the aphasic participant answer consisted mostly of nouns; while, the healthy participant answer was more detailed and included a wider variety of function and content words. The results show the limited variety of words used by aphasic participants, and their reliance on delivering the intended communication target through using nouns mostly.

Table (16): Non-Fluent Participants Responses Distribution in Parts of Speech

Part of speech Response type	Response No %	Percentage No %
Adjective	5	14%
Pronoun	4	11%
Nouns	11	30%
Root verb	0	0%
Verb + suffix	0	0%
Verbs+ prefix	2	5.5%
Past verb	3	8.3%
Present verb	5	14%
Conjunctions	2	5.5%
Preposition	3	8.3%
Article	1	2.0%
Adverb	0	0%

Table (16) observed the non-fluent aphasic participants' responses consisted of 30% for the use of nouns and 14% for the use of adjectives. Non-fluent participants revealed a limited use of verbs and function words. Non-fluent participants did not use any verb connected to a suffix; which can relate to tip of tongue phenomenon and word finding difficulty.

Table (17): Fluent Participants Responses Distribution in Parts of Speech

Part of speech **Response type**	**Response** **No %**	**Percentage** **No %**
Adjective	8	9.0%
Pronoun	4	4.4%
Nouns	18	20.0%
Root verb	4	4.4%
Verbs+ suffix	9	10.0**%**
Verb + prefix	2	2.0%
Past verb	12	13.3%
Present verb	3	3.0%
Conjunction	6	7.7%
Preposition	7	8.7%
Article	11	12.2%
Adverb	6	7.6%

Table (17) observed the fluent aphasic participants' responses that mainly consisted of a variety of contents words and function words. Fluent participants revealed ability of using verbs and function words within sentence production, however; they might suffer from comprehension problems causing unrelated answers to the target topic. Fluent patients revealed impairment in comprehension not in lexical retrieval.

b) Agrammatic Speech in Naming Task

Naming task requires retrieval of phonological and semantic information; naming deficit leads to pharaphasias which refers to substituting of one phoneme for another,

substituting a word for another semantically related, verbal association with the former, neologism, circumlocution, and repetition.

A group of five aphasic patients (3 non-fluent and 2 fluent) were required by the speech pathologist to describe two pictures, to depict the difference in performance between agrammatism in spontaneous speech and the picture naming and description task. The therapist assumes that the picture simplifies the speech task as the direct vision to the action would provide easier retrieve for nouns and verbs in the case of aphasic patients. The researcher compared the aphasic patient's answer along with five healthy volunteers to provide a comparison between their answers and the aphasic patient's answers.

Patients were required to identify two pictures:

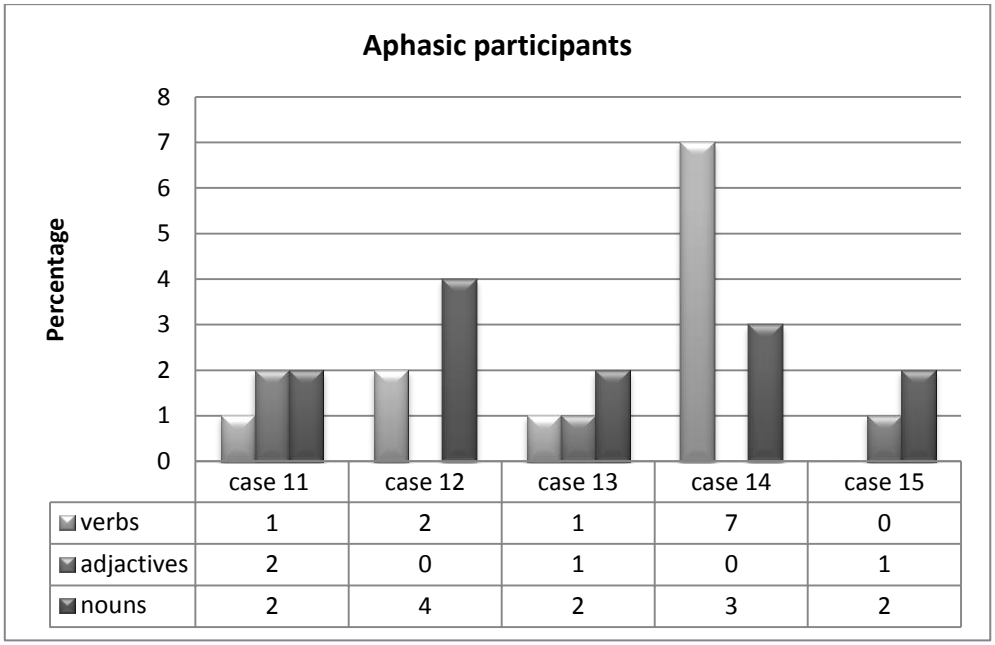
- A boy who plays with a ball
- A girl crying because she dropped her ice cream

Aphasic patient's answer constituted simple words "content words" such as saying "ولد, طاب,بنت", which is translated as " boy, ball, girl" while the non-fluent patients omitted all connectors, conjunctions, prepositions, and the article "and" is usually used by fluent and non-fluent patients. The one fluent patient was able to produce a long sentence and he combined both sentences as if they were related to each other's as he said "الولد بلعب بالطابة و البنت بتبكي عشان مش مخليها تلعب بالطابة" the sentence is translated literally as follows: "the boy plays with the ball and the girl cries probably he did not play with her". The study shows that people who suffer damage in Broca's area or near to it; were significantly more impaired on verbs than noun naming. However, for Wernicke's area sufferers the naming was poorer in nouns but mostly due to comprehension deficit. Aphasic patients total use of syntax for the whole population

sample was (13) noun, (11) verb, and (4) adjectives. Healthy population sample were requested to describe the two pictures and their answers obtained (30) nouns mainly, (15) verbs and only (3) adjectives.

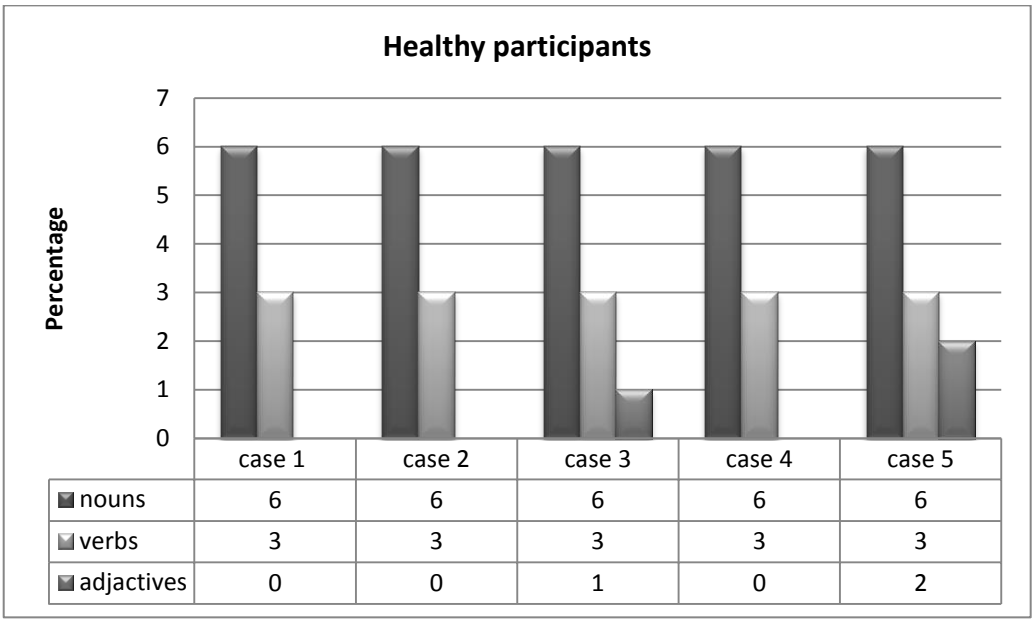
*The speech details are available in appendix (C).

Table (18): Aphasic Participants Naming Task Results



	case 11	case 12	case 13	case 14	case 15
verbs	1	2	1	7	0
adjactives	2	0	1	0	1
nouns	2	4	2	3	2

Table (19): Healthy Population Sample for Naming Task Results



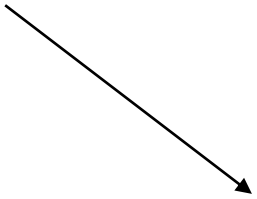
	case 1	case 2	case 3	case 4	case 5
nouns	6	6	6	6	6
verbs	3	3	3	3	3
adjactives	0	0	1	0	2

c) Paragrammatic Speech

Paragrammatic speech occurs when the information is not presented correctly such as; agreement errors and lack of coherent structure.

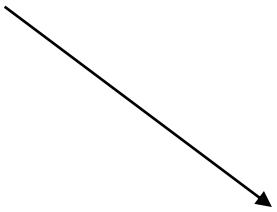
1) In case (7) the patient suffers from meningitis which caused him speech aphasia. The patient is finding difficulty in producing correct agreement errors. The following sentence shows an example of agreement error between the singular pronoun and plural verb:

   - Patient's answer: **I were limping …**



   - Correct form: **I was limping**

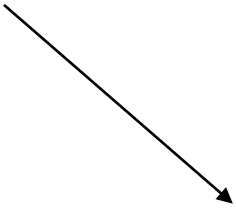
2) In another example the patients also used the plural form to describe his health condition:
   - Patient's answer: **I we walk…we walk**



   - Correct form: **I walk…I walk**

3) In another example the patient suffers from difficulty in producing correct subject-verb agreement:

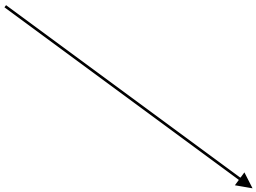
   - Patient's answer: **I…we go…kids…plays**



   - Correct answer: **I go…The kids play**

4) In another example the patient could not produce correct number and age agreement:

- Patient's answer: **six…year**



- Correct answer: **six years**

Aphasia disorder leads to loss of coherence; due to the loss of some aspects of comprehension that causes patients to suffer from learning difficulties and distraction. In the following example is a case where the patient forgets the idea of speech that resulting in loss of the speech coherence.

5) In case (9) the patient loss of concentration caused him inability to complete the sentence.

- The question: **do you the tumor location?**
- Patient's answer: **almost in…I mean…in…in**

The patient took too long in trying to pronounce the first words that caused him loss of memory before being able to answer the question. The patient loss speech cohesion resulted in irrelevant sentence production.

6) In case (7) the patient's speech lacks cohesion as he includes irrelevant information within the speech.

- The question: **would you tell me what happened to you?**
- Patient's answer:

Doctor put a device and gave me six injections welcome you honored

Relevant to question *irrelevant to sentence*

7) In case (5) the patient suffers from left hemisphere damage which caused her aphasia along with comprehension problems. The patient speech lacks coherence with the topic of question directed to her.

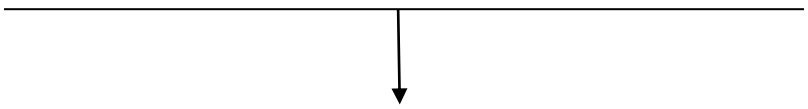
- The question: **are you practicing with speech pathologist?**
- Patient's answer: **spasm…constipation**

Irrelevant to question

8) In case (11) the patient suffers from damage in the back of the left hemisphere which caused him non-fluent aphasia. The patient's speech is fluent but lacks sense.

- Question: would you tell me what happened with you?

- Patient's answer: **khawla asked me to go to the supermarket, I went and everyone greeted me, and then I took a water bottle from the oven, I was very thirsty and I went out to walk on the water and saw my brother Mohammed. We went fishing and greeted many people, were a sweet trip.**



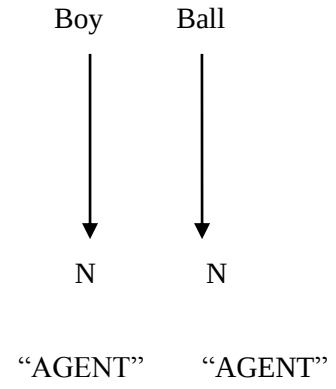
The whole answer is not coherent with the question, and the content of the answer itself does not make sense for the listener.

d) Mapping Hypothesis

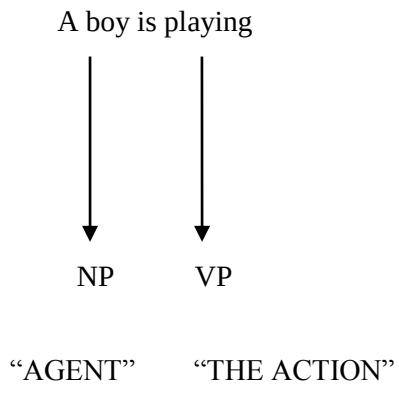
Agrammatic patients suffer from difficulty in comprehending semantically reversible complex sentences. Being semantically reversible occurs when both subjects in a sentence do an action or are affected by the action of the verb.

The patient Naser, has been requested to describe two pictures to the therapist his answer revealed his verb deficit; as he focused on naming the subjects and objects without including the verb. The patient was capable of using only two nouns “boy” and “ball” without including any connectors, the patient substituted the functional morphemes by silence gap.

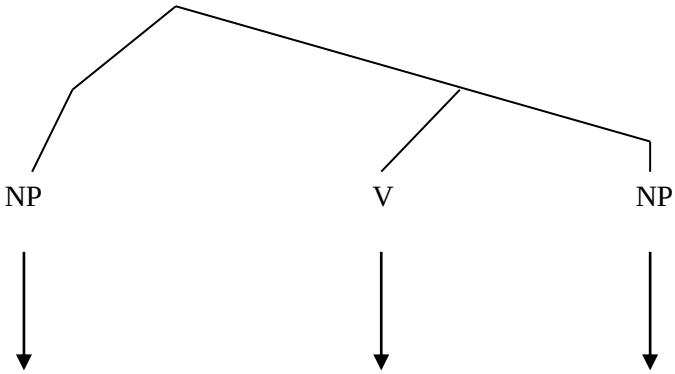
The patient’s answer:



The actual photo shows:



The boy is playing with a ball



The boy is playing with a ball

The boy is the doer of the action → the agent

Playing is the action → the action

The ball is the receiver → the theme

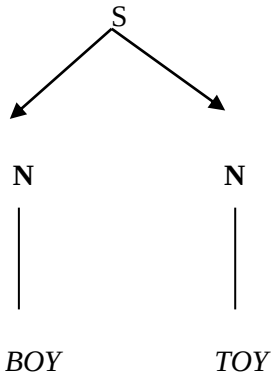
e) Trace Deletion Hypothesis

Agrammatism is found mostly in Broca's area suffers, as its function is the production of trace. Patients have difficulty understanding sentences that have non-canonical word order; as without traces agrammatic patients cannot comprehend the roles of the subject and object within a sentence.

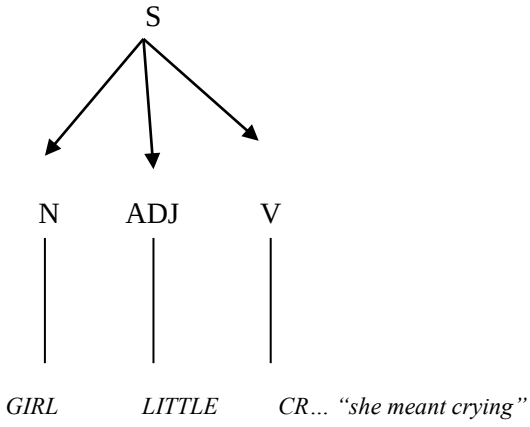
In Fathie's (2) case, she was showed a picture of a boy playing with a ball and another picture of a girl crying because her ice cream fell down, and a third picture of a car with broken glass because the ball hit the car. The patient was asked to describe the first two pictures independently while she was asked to figure out the "doer" of the third

picture. The change in sentence complexity made it difficult for the patient to understand the new roles in the sentence. The patient described the first two pictures as follows:

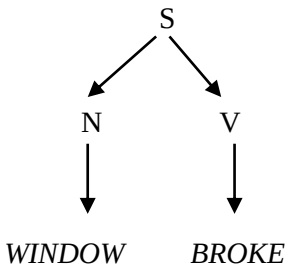
- Description of the first picture according to the patient:



- Description of the second picture according to the patient:



- Description of the third picture according to the patient:



According to the three punning hypothesis the patient syntactic production competence is severely impaired; as she omitted function words, omission of the subject, and incorrect construction.

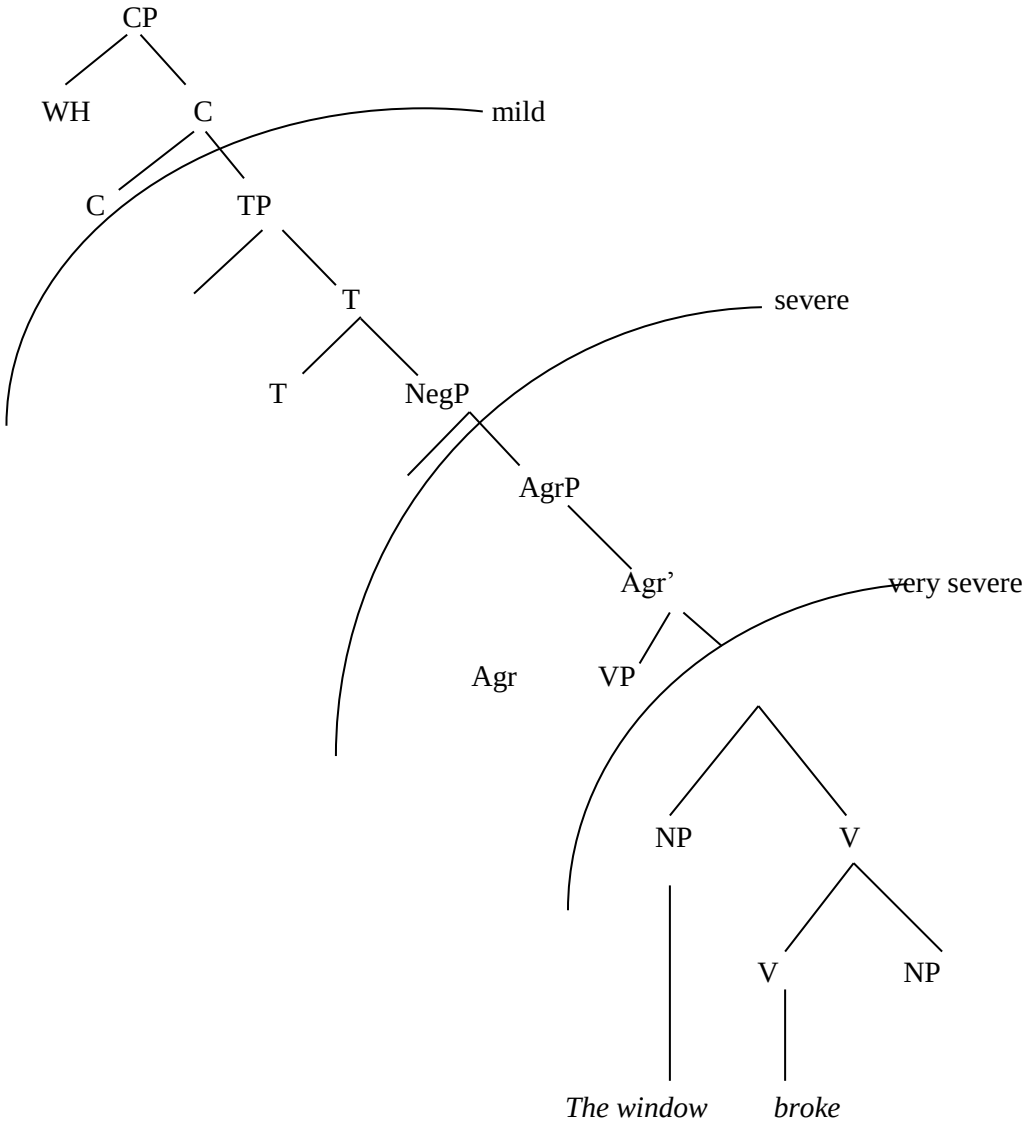


Figure (6): Patients Answer Syntactic Tree

The participant was requested to identify the doer of the action in the third picture by choosing him/her from the 1st or the 2nd picture; the patient could not answer the question; as she could not assign a theta role neither to the girl nor to the boy as she consider both the agent:

The therapist was trying to achieve an answer that might be:

The car window was broken by the boy

Table (20): Aphasia's Patient's Evaluation

N: normal IMP: impaired U: unknown			
Participant	***Fluency***	***Comprehension***	***Naming***
Ahmad	*Imp*	*N*	*N*
Izz	*Imp*	*N*	*N*
Nour	*Imp*	*N*	*N*
Azizah	*Imp*	*N*	*Imp*
Fathie 1	*Imp*	*U*	*Imp*
Aishe	*Imp*	*N*	*N*
Mohammad	*Imp*	*N*	*N*
Abeer	*N*	*N*	*N*
Tal'at	*N*	*N*	*Imp*
Khaled	*Imp*	*N*	*N*
Hassan	*N*	*Imp*	*Imp*
Zahra	*Imp*	*N*	*N*
Naser	*Imp*	*N*	*N*
Fathie 2	*Imp*	*N*	*N*
Talal	*N*	*Imp*	*Imp*

Table (20) depicted the association between fluency and comprehension. From the table results it can be observed that non-fluent aphasic patients mostly did not suffer from comprehension deficit. The results shows that two fluent participants suffered from comprehension deficit and naming deficit along with another two non-fluent participants. The table can conclude to the presence of comprehension and naming deficit in both fluent and non-fluent participants depending on the severity of brain damage.

4.1.1.4 Findings regarding lexical semantics

Patients suffering difficulty in finding the target word might replace it by another word that is semantically and phonologically related to the target word. People who suffer from aphasia will encounter a symptom called anomia which is defined as the difficulty of finding content word. Additionally, they show difficulty in retrieving the first letter of a word, which causes them inability to recall the whole word.

a) Tip of Tongue Phenomenon

Tip of tongue phenomenon was mostly depicted in non-fluent aphasic patients and can occur also in naming people and objects. Aphasic patients can suffer from tip of tongue phenomenon in a word within a certain sentence but they might recall it in another sentence within the same conversation.

Table (21): TOT Phenomenon in Aphasic Patients

Name	TOT times	Target word	Retrieved	substitution	Word class
1	2	*vehicle/mobile*	NO NO	LB -	*noun*
2	1	*left side*	NO	-	*noun*
3	3	*play/ unknown*	NO NO	- -	–
4	1	*doctor*	YES	-	*noun*

b) Anomia

Anomia refers to the difficulties that aphasic patients encounter when trying to find content words. Aphasic patients suffer from difficulty in naming objects due to word-finding problems in language production and comprehension. In a case of anomia, aphasic patients overcome the difficulty of finding the target word by finding related word to describe the target word.

Aphasic patients tend to replace the target word with other words that carry semantic relation with it such as; replacing the word with other word from the same category *cat for dog*, or subordinate *kitten for cat*, superordinate such as *bird for sparrow*, part of whole such as *hand for body*, attribute *blue for sky*, spatial relation *kick for ball*, or circumlocution *horizontal tranquility terminal for bed.*

Table (22): Semantic Relation of Words in Aphasic Speech

Name	Word	Target word	Semantic relation
Case	*LB*	Transport vehicle	*Subordinate*
Case	*eye glasses*	Weakness in vision	*Attribute*
Case	*airplane*	Car	*Same category*
Case	*coocker*	Fridge	*Same category*
Case	*toy*	Ball	*Superordinate*

It can be observed from Table (22) that aphasic patients (fluent and non-fluent) when faced with difficulty pronouncing or finding the target word; tended to use words that carry semantic relations with the target word. Aphasic participants attempt to find an attribute or a replacement of the target word is also not an easy task but remains a successful way to communicate and deliver the intended meaning or request to the listeners.

4.1.1.5 Findings Regarding Pragmatics

Aphasic patients suffer from inability to communicate appropriately in certain contexts due to the damage of specific areas in the brain. Pragmatics involves being able to appropriately use the following linguistic features: turn taking, vocal quality, prosody, speech act usage.

Table (23), is a representation of patient's pragmatic speech features using the appropriateness parameter to define the "appropriate", "inappropriate", and the" not

observed". The symbol (A) is used to indicate (APPROPRIATE), the symbol (I) indicates (INAPPROPRIATE), and the (N/O) indicates that the feature was (NOT OBSERVED) in the participant due to timing, health, or context circumstances.

Table (23): Speech Pragmatic Features for Non-Fluent Patients

A= appropriate I=inappropriate N/O= not observe

Case	Speech acts	Turn taking	Vocal quality	Prosody	Topic maintenance
Ahmad	A	A	I	I	I
Naser	A	A	I	I	A
Fathie 2	A	A	I	I	I
Izz	A	A	I	I	A
Fathie	N/O	N/O	N/O	N/O	N/O
Aziza	I	A	I	I	N/O
Aishe	A	A	I	I	A
Nour	A	A	I	I	A
Zahra	A	A	I	I	A
Mohammed	I	A	I	I	I
Yousef	A	A	I	I	A
Khaled	A	A	I	I	I
Hamzeh	N/O	N/O	N/O	N/O	N/O

Table (24): Speech Pragmatic Features for Fluent Patients

A= appropriate I=inappropriate N/O= not observe

Case	Speech acts	Turn taking	Vocal quality	Prosody	Topic maintenance
Hassan	A	A	A	A	A
Tal'at	A	A	I	I	N/O
Talal	A	A	A	A	I
Abeer	A	A	A	A	N/O

In the previous Tables (23) and (24), is observed that most of the non-fluent patients were able to score "appropriate" in speech act category, for example; greetings were available for all patients except for one patient who did not use any greetings, complaints, or compliments. Furthermore, all fluent patients scored appropriate for speech acts which were mostly depicted in greetings.

In the topic maintenance category 46% of non- fluent patients scored “appropriate” for topic maintenance, while 31% of non-fluent patients scored “inappropriate’, and 23% of non- fluent patients scored “not observed” were those patients were more severely injured than other patients and they suffer from comprehension and speech deficit.

All fluent and non- fluent patients score “appropriate” for turn taking except for two non-fluent patients who scored ‘not observed” in all categories due to their inability to answer any of the questions or provide any possible information.

The previous table indicates that non-fluent aphasic patients scored “inappropriate” in vocal quality where the tone of aphasic patient sound was not clear. Difficulty in pronouncing all sounds of letters by non-fluent patients is also reported in the table.

Non-fluent patients scored “inappropriate” for prosody which includes pitch “women are distinguished by shrill sound with high frequency, while men are distinguished by grave sounds which low in frequency” but in the patient’s speech the difficulty in producing sounds and the frequent omissions of sounds and phonemes resulted in unclear pitch features except that women use thin sound and men use thick sound. Prosody also include the loudness feature which is measured through “soft-loud” scale and for all non-fluent patients loudness was varying but within the soft scale; some of them were soft but it’s possible to hear their speech such as patients “Ahmad, Khaled, Aishe”, but others such as “Azizeh, Mohammed, Nour” were very soft and the listener needs to sit very close to them to be capable of hearing their speech. Another feature of prosody is the length of speech which can be measured through short length and long length. Among the fluent speech patients (3) scored “appropriate” for voice

quality and prosody, except for (1) patient who suffers from speech difficulties but yet is more fluent than non-fluent patients.

The following table depicts the length of speech for fluent and non-fluent aphasic patients, through calculating speaking rate "word per minute" (wpm). The symbol (L) is used to indicate (LONG) speech length and the symbol (S) is used to Indicate (SHORT) speech length (Barnard, 2018):

Table (25): Speech Length for Non-Fluent Participants

Wpm= word per minute L= long S= short

Case	Speech length	Words	Minutes /seconds	WPM
Khaled	S	20	2.23 min	9
Yousef	S	30	4 min	7.5
Nour	S	7	2 min	3.5
Zahra	S	16	1.12 min	14
Mohammed	S	12	3 min	4
Aishe	S	11	2 min	6
Azizeh	S	5	40 sec	2
Fathie 1	S	0	-	0
Hamzeh	S	0	-	0
Izz	S	16	4 min	4
Fathie 2	S	14	1 min	14
Naser	S	19	1.30 min	13
Ahmad	S	16	2 min	8

Table (26): Speech Length for Fluent Participants

Wpm= word per minute L= long S= short

Case	Speech length	Words	Minutes/ seconds	WPM
Talal	S	50	1 min	50
Hassan	S	52	1.17 min	44
Abeer	S	69	2 min	35
Tal'at	S	55	1.40 min	39

Tables (25) and (26) observed that all aphasic patients scored “short” speech length; were the normal average conversation rate varies between 100-150 wpm and all fluent and non-fluent patients scored under the 100 wpm. The highest scored WPM among the non-fluent patients was 14 wpm < 100 wpm that is considered lower than minimum level of the average conversation rate. The highest scored WPM among the fluent patients is 50 wpm < 100 wpm, which is considered lower than the minimum level of normal average conversation rate. Despite the remarkable contrast in scores of the conversation rate between non-fluent and fluent patient, yet both categories are 50% less in WPM to normal average of healthy speakers.

Table (27) compared the results of fluent and non-fluent aphasia in relation to fluency, comprehension, naming, and repetition. The table included as sub-categories of non-fluent aphasia: Broca’s aphasia, transcortical motor, transcortical mixed, and global aphasia. And included as sub-categories for fluent aphasia: Wernicke’s aphasia, conduction, anomic, and transcortical sensory. The symbol (N) is used in the table to indicate (NORMAL), the symbol (IMP) indicates the (IMPAIRMENT) in the mentioned feature. The symbol (*) indicates that the type of aphasia can also cause impairment in (PARAPHASIA) which denotes mostly phoneme substitutions, metathesis, deletion, and addition. The symbol (+) indicates that the aphasia type can also be accompanied with meaningless repetition of words.

Table (27): Aphasia Syndromes

N = Normal or relatively spared, Imp = Impaired, * = with paraphasia, † = with echolalia

Aphasia	Fluency	Repetition	Comprehension	Naming
Broca's (Expressive)	*Imp*	*Imp*	N	*Imp*
Transcortical Motor	*Imp*	N	N	*Imp*
Mixed Transcortical	*Imp*†	N	*Imp*	*Imp*
Global	*Imp*	*Imp*	*Imp*	*Imp*
Wernicke's (Receptive)	N*	*Imp*	*Imp*	*Imp*
Transcortical Sensory	N†	N	*Imp*	*Imp*
Conduction	N*	*Imp*	N	*Imp*
Anomic	N	N	N	*Imp*

Table (27) compared the fluency, comprehension, repetition, and naming task for fluent and non-fluent aphasia. The table depicted that deficit can be present in both categories and sub-categories of aphasia, but varies according to the location and mostly the severity of damage.

CHAPTER FIVE
Discussion, Conclusion, and Recommendations

5.0 Introduction

This chapter discusses the findings of the study in the light of the reviewed literature. It also suggests some possible reasons regarding the findings of the question set forth by the researcher. Finally, some recommendations were proposed for further research.

5.1 Discussion of the Result

This section discusses the findings regarding the question that was set forth by the researcher, which is:

1- What are the linguistic disorders caused by neurological brain damage?

5.1.1 Phonological Deficit

The findings of this study regarding phonological deficit agree with Wardana, Ketut & Suparwa (2018) study and Pirkko (1990) study in relation to the type of errors produced by non-fluent aphasic patients. As the study interviewed three aphasic patients suffering from Broca's aphasia, their analysis depicted four types of phonological errors that include: phoneme substitution, phoneme omission, phoneme deletion, and phoneme metathesis. In addition, the study depicted that non-fluent aphasic patients produce the highest percentage of phonological errors listed in descending order as follow: substitution errors, metathesis errors, omission errors, and finally the addition errors where the less percentage of phonological errors for the three patients.

The researcher study agreed with Wardana, Ketut & Suparwa (2018) study and Pirkko (1990) study in the type of phonological errors produced by aphasic patients

however, it did not mirror the researcher study in the percentage errors distribution. To illustrate, the researcher analysis of error percentage distributed among non-fluent aphasic patients depicts that phonological omission is the most common error while phonological substitution comes next followed by phonological addition errors. Phonological metathesis errors were the least prevalent among non-fluent aphasic patients.

The finding of this study regarding the phonological deficit supports Blumstein (1973) reports in her research; as she collected the data by conducting interviews with aphasic patients to depict error types such as: phoneme substitution, omission, contextual errors, and insertion or metathesis errors. In Blumstein study, the total number of phonological errors made by non-fluent aphasia patients is 1993 while people suffering from fluent aphasia produced only 219 errors. Similarly, the researcher study recorded that non-fluent aphasic patients in comparison with errors committed by fluent aphasic patients committed more phonological errors.

In reference to Blumstein study, the detailed distribution of aphasic errors is presented in table (28) as follows:

Table (28): Distribution of Aphasic Errors (Blumstein, 1973)

	Broca	**Wernicke**
Phoneme substitution	48.7%	35.2%
Omission	24.7%	30.3%
Contextual	20.0%	20.7%
Insertion	6.6%	13.8%

The researcher findings are compatible with Blumstein (1973) findings in term of the total number of errors made by non- fluent aphasic patients are higher than the total number of errors made by non- fluent patient in nearly 50%. However, it does not

comply with the distribution of aphasic errors in Blumstein study. In the researcher study, the phonological omission recorded higher than the substitution errors due to the presence of Nour's case that suffers from deficit in the speech production area in the brain causing her omission of every first phoneme in each word within her speech.

The study is consistent with Buckingham & Yule (1987) findings; in which they argue that phonological articulatory impairment produces traces of the original word. The researcher study depicted that aphasic patients produce traces of the words that they might not be capable of retrieving or that undergoes substitution, omission, addition, or metathesis; but remains within the traces of the original word.

5.1.2 Morphological Deficit

The finding of morphological deficit in the production of bound and functional morphemes matched the findings of Dickey, Milman, and Thompson (2008) that aphasic sufferers show deficit in producing functional morphemes, tense, and agreement. Their findings showed that grammatical morphemes (complementizers, verb inflections) were impaired in aphasic patient's case. Aphasic participants were impaired for the verb inflection more than functional morphemes production.

Moreover, the study findings are harmonized with Garrett (1984) and Lapointe (1985) who argue that morphological agreement errors results due to deficit in the sentence processing mechanism while single word processing remains unimpaired. Patients within the researcher study showed deficit in number agreement and subject verb agreement but were able to use the words correctly when used out of sentence context. This reveals more deficits in sentence formation rather than lexical formation.

According to Miceli (1989) grammatical agreement may be differentially affected in subject-verb agreement, noun-adjective, and determiner-noun agreement. The amount

of morphological agreement errors is less than the function word errors due to damage to syntactic non-lexical processing. The researcher study also depicted the omissions in function words by aphasic patients in syntactic processing where patients are capable of producing free morphemes but unable to include functional morphemes such as the following sentence taken from aphasic patient's conversation:

- "Boy…Ball" ⟹ all functional morphemes omitted = lexical structure
- A boy and a ball ⟹ functional morphemes included =syntactic structure

The researcher study is consistent with the study conducted by Badecker & Caramazza (1987) which observed that the error types committed by patients were; morphological substitution, morphological insertion, and morphological deletion. In this study patients also used the previously mentioned strategies of substitution and omission or addition and morphological metathesis errors.

Production of illegal combinations of morphemes by patients was another correspondent finding in both the researcher study and Bedecker & Caramazza (1987) study. In the researcher study it was observed that some participants tended to produce illegal combinations; in an attempt to simplify the words through changing the suffix to fit the participant communication disorder.

5.1.3 Syntactic Deficit

The findings of this study reveal that left hemisphere severely injured patients suffer difficulty in word finding which results in impaired sentence production due the omission of all function words while preserving content words. Right hemisphere

injured patients suffered from comprehension and concentration deficit more than linguistic deficit.

The findings of the study are consistent with Thompson (1995) research of five aphasic patients; where she argues that non-fluent aphasic patients produce simple, poor structured sentences, and frequent omission of grammatical morphemes. Syntactic or grammatical deficit within aphasic patients is a characteristic of non-fluent aphasic patients. The researcher interview with non-fluent aphasic patients revealed their syntactic deficit as none of them produced a correct grammatical sentence form as they mostly used the following sentence structure *N+N+ADJ* rather than using the general simple grammatical structure *SUBJ+VERB+OBJ+COMP*. The researcher argument concluded that non-fluent patients suffer from agrammatism. Aphasic patients choose shorter grammatical structures to provide communication that is more efficient; the findings studies arose clearly in patient Mohammed's case; where he uses very simple and single words to describe his conditions. On the lexical speech level, the patients used mostly simple words, and same the syntactic features of speech shows that he used mostly nouns rather than full sentences; such as answering with the words "الم" "تعب" "إجر" "نضارة". The patient speech depicted his inability to use Arabic coordinating conjunction "و"as he did not use it at all within his speech, but instead used silent thinking pauses. The patient rarely used any grammar within his speech as he answered for the researcher questions without using verbs such as; "أحتاج نضارة" –"اعاني من الم" اشعر بخضران"which is translated into English as follows; "I need eyeglasses", "I suffer from pain", "I feel numbness", all verbs and connectors where omitted from his speech as he simplifies his speech as much as possible in order to be able to communicate more effectively.

"وجع" "ضعف" "الم" "نضارة" "خضران"

The findings of this study are consistent with Caramazza, Cappelletti, and Shapiro (2008) researches conducted in the field of brain injury. Left hemisphere language areas produce nouns and verbs; as the nouns seems to be produced in the temporal lobe, and the verbs are retrieved from prefrontal areas. The findings are also consistent with the study conducted by to Damasio & Tranel (1993) in which they argue that patient's inability of producing verbs within their speech is linked to neuroanatomical bases, as verbs are mainly produced in the left frontal lobe so any damage within this area will probably result in patients limited ability to produce correct verb forms.

5.1.4 Semantic Deficit

The findings regarding semantic features of speech in aphasic patients supports the discussion of Ahlsen (1991) that aphasic patients usually replace the target word with a word that is semantically or morphologically related to it. The reason why aphasic people replace target words is due to a disturbance in the access path of information within the brain. Participants unable to recall the target word will often replace it by a word that is semantically or phonologically related to it. Semantic related words that fall within these categories: same semantic category such as; cat for dog, superordinate such as; forest for trees, subordinate, such as; sparrow for bird , part of whole such as; head for body, attribute such as; blue for sky, spatial relation such as; head for cap, and functional casual relation such as; dance for party. In the researcher study the fluent aphasic patient tended to find a semantically related word due to suffering from "word finding difficulty". Fluent aphasic patients in the researcher study replaced some words with other words that are semantically related to the target words; due to comprehension difficulties. The researcher study found out that aphasic patients (fluent and non-fluent) tend to substitute words with words that carry some semantic association with the target

word. Participants produced semantic relations such as; (subordinate, attribute, superordinate, and same category) in order to overcome communication difficulties.

The study is consistent with Pena-Casanova (2005) argument that anomia or the lexical processing impairment is associated with different types of aphasia. Aphasia is divided into fluent and non-fluent; the fluent aphasias include "anomic aphasia, conduction aphasia, Wernicke's aphasia, and sensory transcortical aphasia. The non-fluent aphasias include Broca's aphasia, motor transcortical aphasia, and global aphasia. Fluent aphasia sufferers tend to produce augmented verbal production, verbal paraphasias, and jargonaphasia. Non-fluent aphasia sufferers tend to produce effortful production, articulatory slowing, aprosodia, reduced sentence length, and dysarthia.

As being constant with Butterworth, Howard and Mcloughlin (1984) that patient's semantic errors are the results of a deficit in retrieving a full semantic relation with lexical items, but patients are able to determine partial information about the heard word. The study revealed that Wernicke's aphasic patients produced 18% errors and Broca's aphasia patients produced 9% semantic errors, but the overall study results depicted that semantic errors depend on the severity of aphasia despite the type of aphasia. In general, patients can produce semantically correct words when no semantic distracters are available. The researcher study found that non-fluent patients where more able to understand semantic association of words but they suffer from difficulty in lexical retrieval while fluent patients suffered more difficulty in understanding the semantic associations rather than lexical production, due to comprehension impairment. However, severely injured Broca's aphasia patients might suffer inability of comprehending semantic relations.

5.1.5 Pragmatic Deficit

The researcher study is consistent with Avent and Wertz (1996) study that discussed the difference in pragmatics between adults with fluent aphasia and adults with non-fluent aphasia; in an analysis that included turn taking, topic initiation, topic maintenance, vocal quality, prosody, speech acts, facial expressions, and gestural usage. The analysis results depicted that adults with fluent aphasia produced higher level of pragmatic appropriateness compared to non-fluent aphasic adults. Topic maintenance, turn taking, prosody, and speech acts were measured to depict the difference in appropriateness between fluent and non-fluent aphasic patients. The researcher study revealed that non-fluent patients scored appropriate in turn taking and speech acts but they scored inappropriate for prosody, topic initiation, and vocal quality. On the other hand, the fluent aphasic patient has scored appropriate in prosody, vocal quality, and speech acts; but scored inappropriate in topic maintenance and topic initiation.

The findings are consistent with Ojemann (1986) that patients who suffer from aphasia usually complain of memory impairment. This reflects the aphasic patient's loss of memory and poor comprehension. The researcher aphasic study sample depicted that all aphasic patients disregarding the type of aphasia mostly suffer from loss of concentration, loss of memory, and poor comprehension. Two of aphasic sample depicted in the researcher sample are still in their school academic years and they both suffer from learning difficulties and loss of memory and concentration.

5.2 Summary of Results

This study aimed at examining the linguistic disorders caused by damage in the brain. To conduct this investigation; an interview was conducted with seventeen aphasic

patients; the linguistic disorders were analyzed using descriptive and qualitative methodologies.

By explaining the findings of this study in light of the results of the reviewed literature, the researcher determined if any linguistic disorder took place in the aphasic patient's speech, and attempted to suggest a reason for each.

The findings of this study show that aphasic patients suffer from a phonological deficit in speech production such as addition, omission, addition, and metathesis of phonemic errors. Non-fluent aphasic patient's speech tends to be more phonologically impaired than the fluent patients are.

Moreover, the morphological deficit is caused by damage in the brain. Morphological deficit results in impaired production of functional morphology. Bound morphemes and free morphemes tend to be impaired in aphasic patients. People suffering non-fluent aphasia tend to produce more morphological errors than fluent aphasia sufferers do.

Thirdly, the findings of the study showed that aphasic patients suffer from syntactic deficit. Syntactic impairment is associated with the symptoms of agrammatic speech production; which is an effortful speech with simplified utterances accompanied with limited use of grammar through relaying on nouns rather than verbs, function words, and affixes. Broca's aphasia suffers often show greater syntactic impairment as they are able to use content words like nouns and verbs but they find difficulty in using grammatical structures.

Furthermore, semantic deficit took place among aphasic patients speech through incorrect responses or unrelated response to target questions. Semantic deficits caused due to poor comprehension; which results in poor control over semantic processing.

Aphasic patients suffer from difficulty in producing or finding target word, so they tend to replace it by other words that have some sort of semantic relation to it.

On the other hand, pragmatic deficit links comprehension abilities along with the use of language in social context. Pragmatic deficit depicts conversational skills, non-verbal communication, understanding non-literal language, and expressing emotions.

Finally, the above results cannot be generalized beyond the selected sample, because it is constrained by few limitations; the severity of damage, each patient's personal speech style, and the type of discussion, which might all have affected the linguistic competence for each patient.

5.3 Conclusion

This study attempts to find out phonological, morphological, syntactic, semantic, and pragmatic impairments caused by damage to certain areas in the brain.

In the selected sample, the patients are classified as fluent and non-fluent aphasic patients to depict the linguistic characteristics produced by both types of aphasia. The fluent aphasic patients such as; Broca's aphasia sufferers find difficulty in comprehending receptive language, while non-fluent patients such as; Wernicke's aphasia suffers find difficulty with expressive language.

The brain-language study give raise to a new field of study called Neurolinguistics, which depicts the relation of language with brain and explores the functions of brain parts and its development. Speech disorder caused by damage to the brain causes the patients to suffer from decrease in understanding spoken words and sentences. Patients maintain the cognitive abilities but they face difficulties in attempting to express their emotions and needs. Brain damage can be caused by stoke, tumors and traumatic brain

injury. The affected linguistic functions vary depending on the area of damage in the brain (Ubaidullah & Arshad & Muhannad, 2011).

Moreover, the study also attempted to show how the damage to speech production areas within the brain could cause phonological damage; some patients lose the ability of pronouncing or spelling certain speech sounds or sometimes more than one sound within the same word is impaired causing the patients difficulty in expressing themselves. Morphological deficit can also cause patients inability of forming correct word structure through bounding the word to inappropriate prefixes or suffixes that causes incorrect word forms in the patients speech. If a patient faces difficulty in recognizing lexicon, then a deficit here should lead the patients to hear a different word that might not be the intended word but only phonologically related to the intended word.

Agrammatic speech produced by aphasic patients is caused due to the impaired syntactic structure in fluent and non-fluent patient's speech. Syntactic deficits in aphasia cause the patients to face difficulties in the production of complex sentences giving rise to the use of simple canonical SVO sentences only (Niemi & Laine, 1997).

These linguistic deficits are not static; patients suffering from aphasia may regain their full speech and language skills or they may never do so. Improvement of linguistic features depends on the severity of damage and the location of damage. However, some patients learn new communication skills to reclaim some sort of their independence. It is worth to mention that disregarding the language spoken by the aphasic patients whether their mother tongue is Arabic, English, Italian or French; patients will lose some aspects of their linguistic capabilities depending on the location and severity of the brain damage.

5.4 Recommendation for Future Research

According to the results of the study, the researcher suggests the following:

1- To observe the neurolinguistic deficits of aphasic patients more accurately, the study can be replicated for contrast of findings.

2- The researcher also recommends for other researchers to examine linguistic deficits in conversations that are conducted in more casual contexts; in order to observe the patients linguistic deficits in daily speech contexts that cannot be carefully observed in formal and limited to context interviews.

3- Provide more support to young age aphasic patients to participate in spreading awareness about aphasia in local community.

4- The researcher suggests the popularization for tutors, job facilities, and society in general the need to be patient in listening and encouraging aphasic patients to speak out bravely, and avoid apprehensions. The more aphasic patients practice the language the more they retrieve their abilities in relation to language components.

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Appendices

Appendix (A)

Symbols

The following symbols are used in the research:

Symbol	Meaning
<>	**Transliteration**
" "	**Arabic information**
( )	**Detailed information**
“ “	English information

Appendix (B)

Glossary

The following definitions are summarized from the study to facilitate locating any needed definition.

Aphasia: is a language disorder due to damage in certain areas of the brain which are responsible for language production and comprehension.

Anomia; a linguistic disorder caused by brain damage which causes inability in retrieving known words.

Broca's aphasia: caused by damage to broca's area in the brain. Broca's aphasia leads to problems in language processing; causing the production of short phrases or sentences, slow speech, and omission of functional morphemes.

Broca's area: discovered by Paul Pierre Broca in 1861, its located in the left inferior frontal gyrus. Its major function is language production.

Wernicke's area: discovered by Carl Wernicke in 187, its location lies in the left posterior superior temporal gyrus.

Wernicke aphasia: caused by damage to Wernicke's area in the brain which leads to problems in language comprehension.

Gyrus: Are the folds and bumps in the cerebral cortex, and is usually surrounded by one or more sulci.

Insula: a small region of the cerebral cortex which separates the frontal and parietal lobes from the temporal lobe.

Sylvian fissure: is a deep fissure in each hemisphere that separates the frontal and parietal lobes from temporal lobe.

PET: positron emission tomography a type imaging technique that measure change in blood flow.

TMS: transcranial magnetic stimulation which uses magnetic fields to stimulate nerve cells in the brain.

Superior temporal gyrus (STG): is involved in auditory processing, including language and social cognition.

Superior temporal sulcus (STS): located between left and right hemisphere, STS belongs to the left hemisphere and produces strong responses to faces, voice, and language.

Paralexia: a reading disorder in which words and syllables are meaninglessly transposed. Paralexia is usually associated with brain damage.

Paraphasia: is a speech disturbance due to brain damage in which words and sentences are meaningless.

Agrammatism: is a disorder which causes difficulty in using basic grammar and syntax, or word order and sentence structure.

Onset nucleus coda: is the consonant that precedes the peak and the coda is the consonant that follows it. In the word CAT the “c” is the onset, “a” is the nucleus, and “t” is the coda.

Cerebral cortex: is the outer layer of neural tissue of the cerebrum of the brain, involves the following functions; determining personality, planning, organization, touch sensation, language processing, determining intelligence.

Frontal lobe: is the right forward area of the brain and is important for cognitive functions and control of movement and activity.

Parietal lobe: located near the back and top of the head of the cerebral cortex and is responsible for processing information about taste, touch, movement, and temperature.

Temporal lobe: one of the major lobes in the cerebral cortex is located in the lower area of the cortex. Temporal lobe is responsible for creating and preserving conscious and long term memory.

Occipital lobe: is the rearmost lobe of the brain is responsible for interpreting information from the eyes into information.

FMRI: functional magnetic resonance imaging is used to measure brain activity through detecting changes in brain blood flow; when an area of the blood is being used the blood flow will increase in that area.

Neurolinguistics: is a field of linguistics which studies the relationship between language and the functioning of the brain.

Psycholinguistics: is a field of linguistics which investigates the psychological processes that assist humans in producing and comprehending communication.

Syntax: the arrangement of words and phrases in sentences, and how sentence structure interacts with other linguistic information.

Morphology: the study of word structure and word formation; involves morpheme, free morpheme (lexical, functional), and bound morpheme (inflectional, derivational).

Syntactic: the rules of language; the basic syntax form is “subject+verb+direct object”.

Semantics: the study of meaning of words and sentences and how sentences are understood by the speakers of language.

Metathesis: two phonemes that switch their position in a word

Omission: the deletion of a phoneme in a word.

Paraphasia: word substitution to another word that might be related or unrelated to it or small changes within the word.

Substitution: One phoneme is replaced by another phoneme.

Onset: the first sound of a syllable.

Appendix (c)

Aphasic patient's conversation

The following symbols are used in the conversations:

Symbol	Meaning
(.....)	**Speech could not be heard**
*	**Observation**
( )	**Notice**
" "	**Description**
.....	**Pauses**

- الباحث: احكيلي لو سمحتما اللذي حدث معك؟
- محمد: (.....)
- الابن: ابي محمد يوسف تعرض لجلطة دماغية في الجهة اليمين فصار معو شلل نصفي في الجهة الشمال من الجسم
- محمد: ضعف في النظر "نضارة"
- الباحث: هل لديك اي شكوة اخرى؟
- محمد : وجع .....خفيف.....الم
- المعالج: التركيز على تحسين المشي و تخفيف الام من خلال علاج وظيفي
- محمد : في دوا مسكن للقدم؟
- الباحث: شو اكثر شيء تشعر انه يزعجك بعد الاصابة بجلطة دماغية؟
- محمد : تمام بس خضران... وجع بي إجر

Translation of conversation

Patient Mohammed Yusuf suffers from a brain stroke which caused him left side hemisphere.

- RESEARCHER: Would you please tell me what happened with you?
- Mohammed: (…..)
- PATIENT'S SON: My father Mohammed Yusuf suffered from a stroke in the right hemisphere, affected the functions of the left side of the body.
- RESEARCHER: How do you feel?
- Mohammed : Weakness in vision "eyeglasses"
- RESEARCHER: do you suffer from anything else?
- Mohammed: pain……mild……pain
- THERAPIST: we are focusing on improving walking relieving pain through occupational therapy.
- Mohammed: There is medicine for the foot pain?
- RESEARCHER: What is disturbing you the most post-stroke?
- Mohammed: Everything is fine, but numbness and pain in foot

- الباحث: ما سبب الاصابة؟
- عز الدين: كنت راك.. ل ب "يقصد راكب"
- الباحث: ما هو ل ب ؟هل تقصد شاحنة نقل كبيرة؟
- عز الدين: "سيارة توزيع" كتابة بدلا من الكلام
- عز الدين: نازل ...الع..ج..ل...سايق...نط...انا بال...نص....."سيخ" باليد ...
- الباحث: هل تتمرن على استعادة نشاطك؟
- عز الدين: خفي....."يقصد خفيف"
- الباحث: ما مدة علاجك بالمشفى؟
- عز الدين: خم..س سنين
- *يحاول المشي :مما يظهر ضعف في القدرة على السير بتوازن*

- عز الدين: مشا...كل بال...ذاكرة
- الباحث: شو اكتر شيء بتشعر انك لا تتزكره؟
- عز الدين: كل..شي
- عز الدين: "عنوان البيت و الطريق" كتابة بدل من الكلام
- الباحث: و اذا حاولت التذكر و اعطيت نفسك بعض الوقت هل تستعيد الذاكرة؟
- عز الدين: تلف..."يقصد تلفون"
- عز الدين: كنت دا...رس...شهادة...كم...بيو "يقصد كمبيتر"

Translation of Conversation:

- RESEARCHER: what caused you the injury?
- IZZ EL DIN: I was sea…in LB "he means seated"
- RESEARCHER: what is the LB, is it a big transport vehicle?
- IZZ EL DIN: "distribution vehicle" he wrote it down
- IZZ EL DIN: descend...ing…jum…ped…midd...le……driv…er… me...tal…in... hand
- RESEARCHER: are you practicing in order to recover?
- IZZ EL DIN: litt… "he means little bit"
- RESEARCHER: how long have you been treated in the hospital?
- IZZ EL DIN: 5 yea…rs
- *he attempts to walk which reveals weakness in the ability to walk with balance*
- IZZ EL DIN : prob…lems with me...mo...ry
- RESEARCHER: what do you forget the most?
- IZZ EL DIN: every…thing…
- IZZ EL DIN: "the address of the house and the road" he wrote it down
- RESEARCHER: if you try to remember and give yourself some time, will your memories recover?
- IZZ EL DIN: no… pho "he means phone"
- IZZ EL DIN: I… had…a…degree…in…com… "he means computer"

- الباحث : اخبريني ما الذي حصل معك؟
- فتحية:....."لا تستطيع الكلام"
- الباحث: اسمك فتحية؟
- فتحية:مممم.....
- الباحث: هل شعرتي بأي تحسن بعد العلاج الطبيعي و الوظيفي و علاج النطق؟
- فتحية: ....."لا تستطيع الكلام"

Translation of conversation:

Fathie suffers from damage in the posterior right side of the brain which caused her left side hemiplegia and inability of speaking or moving.

- RESEARCHER: would you tell me happened with you?
- FATHIE: ……. "she couldn't speak"
- RESEARCHER: is your name Fathie?
- FATHIE: mmmm
- RESEARCHER: did you feel improvement after attending the occupational, physiotherapy and speech therapy?
- FATHIE: ……. "she couldn't speak"

- الباحث: احكيلي عن حالك؟
- عبير: كان عمري اربع سنين و سيارة دعستني و دخلت غيبوبة شهر و فقدت الحركة في الجهة الشمال...الضربة خلتني ما اقدر اصفق ولا اقدر امسك الكاسة بقوة و اشعر انا صرت احتاج الى رفع صوتي و رأسي للاعلى حتى اتمكن من نطق الحروف خاصة حروف السين و الجيم. صار عندي نقطة دم على الدماغ خلتني اصير عندي تشنجات في ايدي و لرجلي الشمال...و كنت كتير شاطرة بس الاصابة خلتني اصير انسى و ما اقدر اركز منيح.
- الباحث: هل شعرتي بتحسن من خلال العلاج؟
- عبير: اه ايدي ما كانت هيك كانت شادة و كانت اضعف

Translation of conversation:

- RESEARCHER: would you please let me know what happened with you?
- ABEER: when I was four years old, a car hit me, and I fell into a coma for a month and I lost movement in my left body side. The injury caused me inability to clap, and I could not hold the cup firmly, and I feel that I need to raise my voice and tilt my head up so that I can pronounce letters such as the “sh” and the “g”…. as I had a blood clot in the brain which caused me spasm in my hands and my legs…. I was very smart but after the injury I forget a lot and I cannot concentrate.
- RESEARCHER: do you feel better through the therapy?
- ABEER: yes, my hands were weak but they are getting stronger.

- الباحث: كيف حالك؟
- عزيزة: (....)
- الباحث: هل ممكن تخبرني اللذي حصل معك؟
- عزيزة:(.....)
- الباحث: شو بتشعري بعد الاصابة؟
- عزيزة: ت....شنج...نام عادي...اص..حى... مش طبي...عية...
- الباحث: هل تحاولين التمرن مع معالج النطق؟
- عزيزة: تش...نج...امساك
- الباحث: هل تحاولين التمرن على تحسين الكلام؟
- عزيزة: لا

Translation of conversation:.

- RESEARCHER: how are you?
- AZIZA: (…..)
- RESEARCHER: would you tell me what happened to you?
- AZIZA: (…..)
- RESEARCHER: how do you feel after the stroke?

- AZIZA: spa…sm…slee…p fi...n...wa...ke…up…not...fine
- RESEARCHER: are following up with speech pathologist?
- AZIZA: spa…sm…constipation
- RESEARCHER: are you practicing to improve your speech abilities?
- AZIZA: no

- الباحث: احكيلي شوي شو صار معك؟
- عائشة: انداري شو… صار...بتع..ب...
- الباحث: هل تشعري بخضران في اليد؟
- عائشة: اه حضران "تقصد خضران"
- الباحث: متى صارت معك الاصابة ؟
- عائشة: نعش "تقصد طنعش" اي عدد اثنا عشر عام
- الباحث: شو بتشعري كمان؟
- عائشة: برد...بضل..تحت حاف… صوبة "تقصد اللحاف"

Translation of conversation:

- RESEARCHER: would you tell me what happened with you?
- AISHA: I don't…know… am tire...d
- RESEARCHER: do you feel numbness in your hand?
- AISHA: numness "she said the word incorrectly= numbness"
- RESEARCHER: when did the stroke happen?
- AISHA: telv "she said the word incorrectly=twelve"
- RESEARCHER: what else you suffer from after the stroke?
- AISHA: cold …I …stay…under… uilt …heater " she said the word "uilt" incorrectly=quilt"

- طلعت: اهلا و سهلا اهلا و سهلا شرف...تونا
- الباحث: احكيلي ماذا حصل معك؟
- طلعت: اااالدكتور ركب جهاز ووو دقني ست ابرات...بالغلط...اهلا و سهلا...شر..ر..فتونا
- الباحث: قديش عمرك؟
- طلعت: أ....أربعي...ن...صار....معي ....و انا بالسادس
- طلعت: كنت..نعرج شوي قام ابوي..ركبلي جهاز... عى اجري....واووو....دقني ست ابرات...بالغلط....بالغلط....واو..واوو....وانشليت و انشليت.....بطلت اقدر اوقف...سحبولي من ضهري دم...دم...بعدين انشليت
- الباحث: هل تحسنت مع العلاج الطبيعي؟
- طلعت:انا... بنمشي....بنمشي

Translation of conversation:

Tal'at suffers from meningitis swelling at an early age but he was not hospitalized which caused him paralysis and speech disorder.

- TAL'AT:welcome, welcome, you honored us
- RESEARCHER: would you please tell me what happened with you?
- TAL'AT: tttt…the doctor pp…put a device …aaa…and gave me six needles…wrongly…welcome…you…hon...ored…us
- RESEARCHER: how old are you?
- TAL'AT: fff...or...ty... it… happened…when ...I was...six
- TALA'T: I was…we were limping and my father…put a device… on my leg….aaa…and…gave me six needles….wrongly…aaa…and…aaa…and… I got paralyzed… I can't stand up…they took from my back blood…blood…then I got paralyzed
- RESEARCHER: did you feel any improvement through therapy?
- TAL'AT: I….we walk…we walk

- الباحث: شو اسمك؟
- نور:..... نور
- الباحث: قديش عمرك ؟
- نور:.....امسة "تقصد خمسة"
- الباحث: شو اسم اختك؟
- نور: المى "تقصد سلمى"
- الباحث: شو بتعملي بالمدرسة؟
- نور: ددرس "تقصد بندرس"
- الباحث: بتحبي المدرسة؟
- نور: بيبي "تقصد حبيبي"
- الباحث: هل عندك اخوة؟
- نور: نات و واد"تقصد بنات و ولاد"
- الباحث : بتعرفي تكتبي؟
- نور: "تكتب بيدها اليمنى و لاكن عضلة يدها ضعيفة ما بتقدر تمسك القلم"

الباحث: اكتبيلي اسم اختك سلمى؟

- نور: "قامت بكتابة المى بدلا من سلمى"

Translation of conversation:

Nour suffers from speech problems since she was 2 years old, the EEG showed the presence of excessive electrical activity in the articulation areas in the brain.

- RESEARCHER: what's your name?
- NOUR: … Nour
- RESEARCHER: how old are you?
- NOUR: ….. ive "she means five"
- RESEARCHER: what's your sister's name?
- NOUR: ….Alma "she means Salma"
- RESEARCHER: what do you do at school?

- NOUR: …tudy "she means study"
- RESEARCHER: do you love the school?
- NOUR: ….my ove "she means my love"
- RESEARCHER: do you have any siblings?
- NOUR: ….irls & oys "she means girls and boys"
- RESEARCHER: do you write?
- NOUR: "she is right handed but her hand is weak; as she cannot hold the pen firmly"
- RESEARCHER: can you write down your sister's name?
- NOUR: "she wrote Alma instead of Salma"

- المعالج : هل تعرف مكان الورم؟
- احمد: تقريبا فل.....يعني.....في..في..
- المعالج :اخبرني عن ابنك الكبير؟
- احمد: حمزة...خخخ....خمسة سنة...سادسة...طب
- المعالج: ما الذي تراه بالصورة؟ (تم عرض صورة شاكوش و هاتف)
- احمد: موبايل.اه...موبايل..اه...شاكوش...
- المعالج: كيف بتغسل سيارتك؟
- احمد: بنضف ...يعني...ببببب...بغسلها ...يعني.....بغسلها

Translation of conversation:

- THERAPIST: do you know the location of the tumor?
- AHMAD: almost….I...mean…in….in…
- THERAPIST: tell me about your oldest son?
- AHMAD: Hamzeh…ffff... year five…sixth…medicine
- THERAPIST: what do you see in the picture? (a picture of a phone and a hummer)
- AHMAD: mobile…yes…mobile…yes…hummer
- THERAPIST: what do you do you wash your car?
- AHMAD: I clean…www…wash…I mean…I wash

- الباحث: اي صف خالد؟
- خالد: صف....تاسع"ارتفاع بطبقة الصوت بحرف التاء"
- الباحث: شو اللي صار معك؟
- خالد: ....
- الباحث: ليش بتيجي على المركز؟
- خالد: بنات...شفتها...بنات...حمامات زهري...هون شباب...استحيت
- الباحث: هل لديك اخوة يعانون من نفس المشكلة؟
- خالد: لا
- المعالج: هل كان النطق طبيعي عندما كنت صغير؟
- خالد: مخي...في...ذكا...هيه...عندي...مشكلة...مخي....وقعت...صغير...هياسي"يقصد ذاكرة – راسي"
- الباحث: هل تستطيع الكتابة والقراءة؟
- خالد: اه

Translation of conversation:

- RESEARCHER: in which grade you are?
- KHALED: ninth…class "Raised intonation for the second word's first letter"
- RESEARCHER: would you tell me what happened with you?
- KHALED: ….
- RESEARCHER: why do you come to the institution?
- KHALED: females…I seen it…females…pink toilet…here boys…ashamed
- RESEARCHER: do any of your siblings suffer from the same issue?
- KHALED: no
- THERAPIST: was your pronunciation normal when you were a child?
- KHALED: mind…memo…hy…snag…mind…I fall…young…on my head "could not pronounce the /r/ sound"
- RESEARCHER: do you read and write?
- KHALED: yes

- المعالج: كيف حالك؟
- حسن: السلام عليكم
- المعالج: ما اللذي حصل معك؟
- حسن: خولة طلبت مني اطلع على السوبرماركت قمت رحت صار الجميع يسلم علي و بعدها دلت اخدت من الفرن قنينة ماء كنت عشطان كتير و طلعت امشي على الماء و شفت اخوي محمد على ناس كتير و رحلة حلوة."يقصد عطشان"
- المعالج: حسن اوصفلي الصو
- حسن: هاي صور
- المعالج: شو عم بيعملو بالصورة الاطفال؟
- حسن: بلعبو مسبوطين
- المعالج: حتى هاي الطفلة مبسوطة؟
- حسن: لا بس بلعب
- المعالج: شكرا على الاستضافة
- حسن: السلام عليكم مبسوطفي
- حسن: يعطيكم العافية

Translation of conversation:

- THERAPIST: how are you?
- HASSAN: al salam alaikom
- THERAPIST: would you tell me what happened with you?
- HASSAN: khawla asked me to go to the supermarket, I went and everyone greeted me, and then I took a water bottle from the oven, I was very thristyand I went out to walk on the water and saw my brother Mohammed. “he means thirty”
- THERAPIST: Hassan would you describe the picture?
- HASSAN: picture of kids
- THERAPIST: what are they doing?
- HASSAN: they play hallipy

- THERAPIST: and the girl is happy?
- HASSAN: no buthe plays
- THERAPIST: thank you for hosting us
- HASSAN: alsalam alaikom, happyto
- HASSAN: God gives you health “Arabic fixed phrase”

- المعالج:اخبرني عن حالتك الصحية؟
- زهراء: انا...تع..تع...بانة...راسي...ثقيل...اي ص...صوت بي..بيدا...بيدا
- المعالج: ليساتك بتلعبي رياضة؟
- زهراء: اجر..ري...شادة
- المعالج: اوصيفيلي الصور
- زهراء: الولد...لب...طابة" تقصد يلعب"
- المعالج: احكيلي شو اللي بالصور التانية؟
- زهراء: ث..ثيارة...بسة...
- زهراء: البنت...بتبكي...البوظة...تق..عت

Translation of conversation:

- THERAPIST: tell me about your health conditions?
- ZAHRA: am… ti…ti..red…my head…heavy…any…voice…dis..tu..dis…tu
- THERAPIST: do you play sport?
- ZAHRA: my…le..g…stiff
- THERAPIST: describe the picture
- ZAHRA: the boy…py…with ball“she means play”
- THERAPIST: tell me what you see in the other pictures?
- ZAHRA: car…cat
- ZAHRA: the girl…cries…ice cream…lfe...ll“she means fell”

- المعالج: اخبرني ما نوع الجلطة التي اصابتك؟
- فتحية (2): خلطة...جلطة
- المعالج: احكيلي كيف شايفة التدريبات؟
- فتحية (2): تمام...ببب...ب...
- المعالج: شو بتعملي بوقت الفراغ بالبيت؟
- فتحية (2): حفحيدي...و...و...في ولد...اسمو...
- المعالج: اوصيفيلي الصورة
- فتحية (2): ولد...لعبة
- المعالج: طيب الصورة الثانية
- فتحية (2): بنت...صغيرة...بت...بت...
- المعالج:في بالصورة الثالثة شباك سيارة مين كسرو البنت او الولد؟ "صورة زجاج مكسور بسبب الطابة"
- فتحية (2):(.....)
- المعالج: اوصفيلي الصورة الثالثة
- فتحية (2): شباك...انكسر

- **Translation of conversation:**
- THERAPIST: what type of stroke you had?
- FATHIE (2): shtroke…stroke
- THERAPIST: what do you think about therapy training?
- FATHIE (2): good…bb…b…
- THERAPIST: what do you do at your free time?
- FATHIE (2): grangdson...and…and…a boy…his name…
- THERAPIST: describe the picture.
- FATHIE (2): boy…toy
- THERAPIST: describe the other picture
- FATHIE (2): girl…little…cr…cr

- THERAPIST:in the third picture you can see a broken car window that did it the boy or the girl? "a picture that shows a ball broking the window"
- FATHIE (2): (….)
- THERAPIST: can you describe the third picture?
- FATHIE (2): window…broke

- المعالج: كيفك؟
- طلال: تمام الحمدالله
- المعالج: كيف صار معك الحادث؟
- طلال: كنت رايح على الشغل و اجو اصهابي قعدو معي و شربنا قهوة و عندي خالد دايما بساعدني بشغل الطيارة .
- المعالج: شو بتعملو بالسيارة؟
- طلال: مش فاهم؟
- المعالج: انتى قلت انو بساعدوك بالسيارة؟ قصدك سيارة صح؟
- طلال: مش عارف....
- طلال: بشتغل بالمكتب و عندي اغراض اشتريتهم عشان طلبوهم مني و دايما ....."تكملة طويلة غير متناسقة"
- المعالج: اوصفلي الصور
- طلال: الولدركب الطابة و البنت بتبكي عشان مش مخليها تلعب بالطابة
- المعالج: متى بتحب نحدد موعد الجلسة الجاي؟
- طلال: انا بهبك كتير كتير بس ما عندي وقت

Translation of conversation:

- THRAPIST: how are you?
- TALAL: good thanks God
- THERAPIST: how the accident happened to you?

- TALAL: I was going to work and my friehd sat with me and we had coffee and khaled always help me start the plane"he means friend"
- THERAPIST: what do you do with car?
- TALAL: I don't understand.
- THERAPIST: you have said you work on a car, you meant car, right?
- TALAL: I don't know
- TALAL: I work in the office and I have things that I bought because they asked me for them, and they always… "very long incoherent conversation"
- THERAPIST: describe the pictures please
- TALAL: the boy boarded the ball and the girl cries because she is not allowed to play with him
- THERAPIST: when would you like to schedule the next session?
- TALAL: I lohe you so much, but I don't have time."he means love"

- المعالج: كيف حالك؟
- ناصر: منيح...منيح
- المعالج: احكيلي عن حالتك الصحية؟
- ناصر: منيح
- المعالج: شو الجلطة اللي صارت معك؟ شو الاعراض اللي بتشعر فيها؟
- ناصر: الضو...الصوت...كله...متعب...صوت الحديد
- المعالج: باي جهة صارت معك الجلطة؟
- ناصر: شمال
- المعالج: شو بتعمل بوقت الفراغ؟
- ناصر: انا...بنروح...الاطفال...بلعب

- المعالج: قديش عمر حفيدك؟
- ناصر: ستة...سنة
- المعالج: احكيلي شو شايف بالصورة؟
- ناصر: ولد...و...طابة
- المعالج: شو شايف بالصورة الثانية؟
- ناصر: بنت...زعلانة

Translation of conversation:

- THERAPIST: how are you?
- NASER: good…good
- THERAPIST: tell me about your medical condition?
- NASER: good
- THERAPIST: which type of stroke happened to you? What do you feel?
- NASER: light…voice…all…tired me…steel sound
- THERAPIST: which side is the stroke?
- NASER: left
- THERAPIST: what do you do at your free time?
- NASER: I…go…kids…plays
- THERAPIST: how old is your grandson?
- NASER: six…year
- THERAPIST: what do you see in the picture?
- NASER: boy…and…ball
- THERAPIST: and what do you see in the other picture?
- NASER: girl…sad

- الباحث: احكيلي شو اللي صار معك؟
- يوسف: سكري و ضغط و انا بالمحل بطلت شايف... رحت على المستشفى 10 ايام.....
- الباحث:ما الذي تستصعبه في حديثك؟
- يوسف: صعب اه
- الباحث: هل ذاكرتك جيدة؟
- يوسف: نعم
- الباحث: هل لديك ابناء؟
- يوسف: الكبير اربعع...و خمسين و الصغير اربعه تسع سنين
- الباحث: ماذا كنت تعمل؟
- يوسف: صاحب محل
- الباحث: هل تحسنت مع الوقت؟
- يوسف: لا

Translation of conversation:

- RESEARCHER: would you tell me what happened to you?
- YOUSEF: diabetes…blood pressure…in the shop I could not see… I went to hospital 10 days
- RESEARCHER: what bother you the most about speech?
- YOUSEF: yes difficult
- RESEARCHER: is your memory good?
- YOUSEF: yes
- RESEARCHER: do you have children?
- YOUSEF: the oldest four and fifty…and the younger four…nine years
- RESEARCHER: what you used to work?
- YOUSEF: own a shop

- RESEARCHER: did you improve after therapy?
- YOUSEF: no

- المعالج: اين موقع الجلطة؟
- حمزة:.....
- المعالج: هل تستطيع فهم ما اقول؟
- حمزة:.....
- المعالج: اذا كنت فاهم ما اقول انظر للاعلى؟
- حمزة: "يفهم الكلام و لكن لايستطيع النطق"
- المعالج: ما الذي تراة بالصورة؟
- حمزة: "يشير بيده فقط"

Translation of conversation:

- THERAPIST: what is the stroke location?
- HAMZEH: …….
- THERAPIST: can you understand what I am saying?
- HAMZEH: …….
- THERAPIST: if you understand me look up?
- HAMZEH: "he understands speech but cannot speak"
- THERAPIST: what do you see in the picture?
- HAMZEH: "use hand gestures"

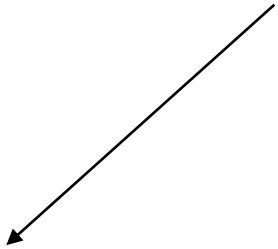
Appendix (D)

Control Sample Answers

تم الاستعانة بخمس اشخاص لا يعانون من اي مشاكل نطقية او ادراكية وتم الطلب منهم صياغة اجابة حالات عينة الدراسة وتم تسجيل الجواب المشترك للأغلبية:

جواب الشخص المصاب

وجع...خفيف...الم

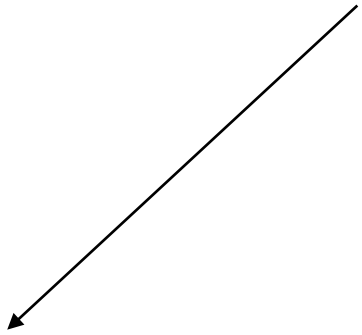


الاجابات المحتملة للأشخاص غير المصابين

- **انا أشعر بألم، ألم خفيف**
- **انا اشعر بألم خفيف**
- **اعاني من ألم خفيف**

جواب الشخص المصاب

تشنج...نام...عادي ...اصحى...مش طبيعية

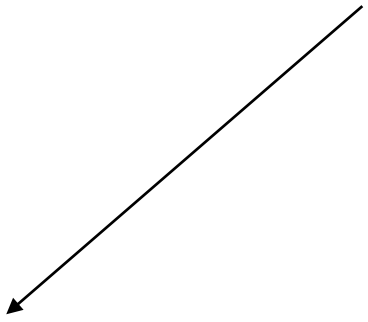


الاجابات المحتملة للأشخاص الغير مصابين

- **اشعر بتشنج, انام جيدا, و لكن عندما استفيق اشعر بتوعك**
- **اعاني من تشنج حيث انني انام جيدا لكني استفيق بحالة غير جيدة**
- **لا انام جيدا حيث انني اعاني من تشنج عندما استفيق**

اجابة الشخص المصاب

حمزة...سنة...سادسة...طب

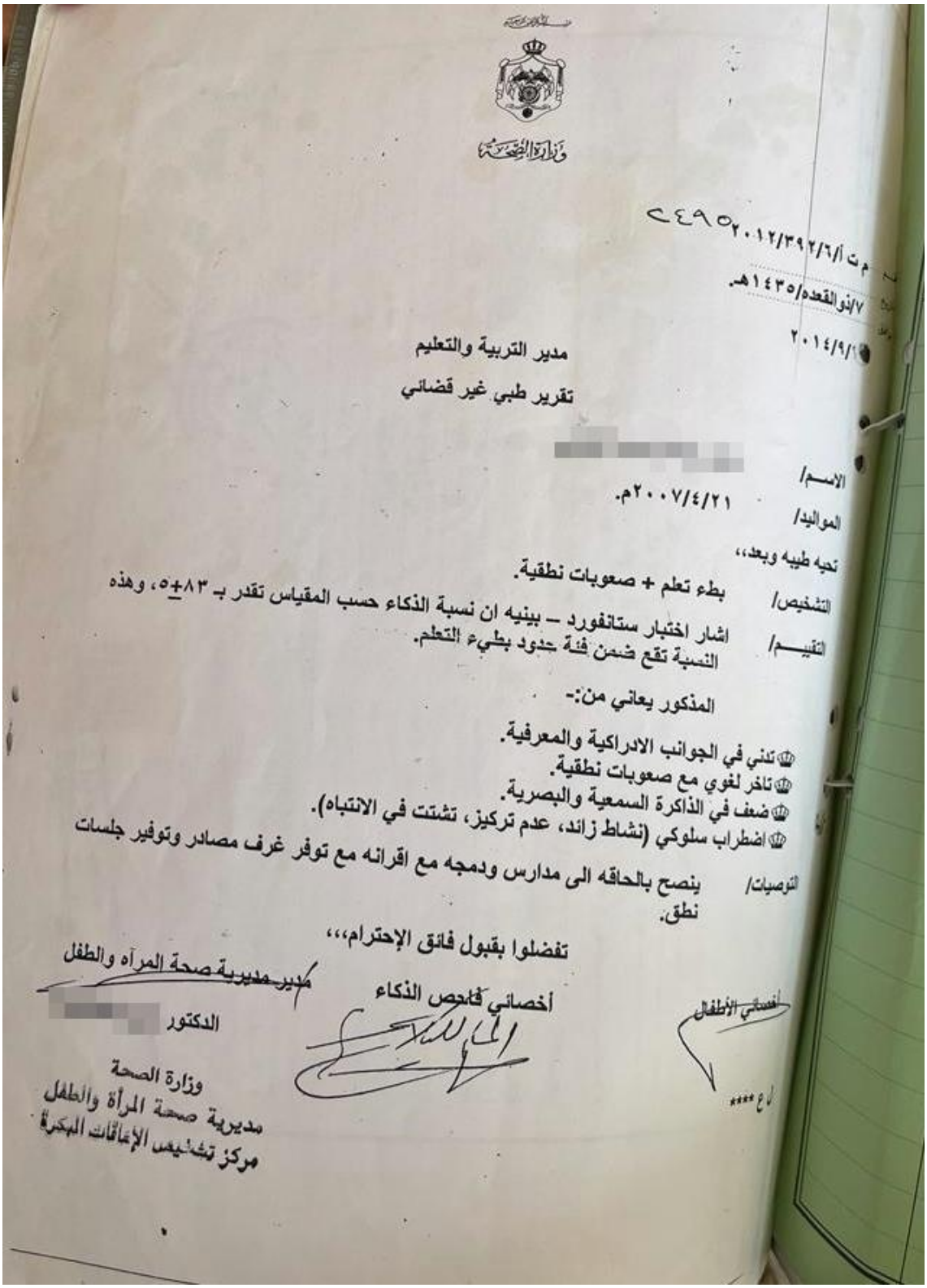


الاجابات المحتملة للأشخاص الغير مصابين

- **حمزة يدرس سنة خامسة او سادسة في كلية الطب**
- **حمزة يدرس في كلية الطب سنة خامسة او سادسة**
- **حمزة يدرس في السنة الخامسة او السادسة في كلية الطب**

Appendix (E)

Patient's Medical Reports



وزارة الصحة

م ت أ/٦/٢/٢٠١٢/٣٩٢٤٩٥

٧/ذو القعده/١٤٣٥هـ.

٢٠١٤/٩/١

مدير التربية والتعليم

تقرير طبي غير قضائي

الاسم/ [redacted]

المواليد/ ٢٠٠٧/٤/٢١م.

تحيه طيبه وبعد،،

التشخيص/ بطء تعلم + صعوبات نطقية.

التقييم/ اشار اختبار ستانفورد – بينيه ان نسبة الذكاء حسب المقياس تقدر بـ ٨٣±٥، وهذه النسبة تقع ضمن فئة حدود بطيء التعلم.

المذكور يعاني من:-

- تدني في الجوانب الادراكية والمعرفية.
- تاخر لغوي مع صعوبات نطقية.
- ضعف في الذاكرة السمعية والبصرية.
- اضطراب سلوكي (نشاط زائد، عدم تركيز، تشتت في الانتباه).

التوصيات/ ينصح بالحاقه الى مدارس ودمجه مع اقرانه مع توفر غرف مصادر وتوفير جلسات نطق.

تفضلوا بقبول فائق الإحترام،،،

أخصائي فاحص الذكاء

[redacted]

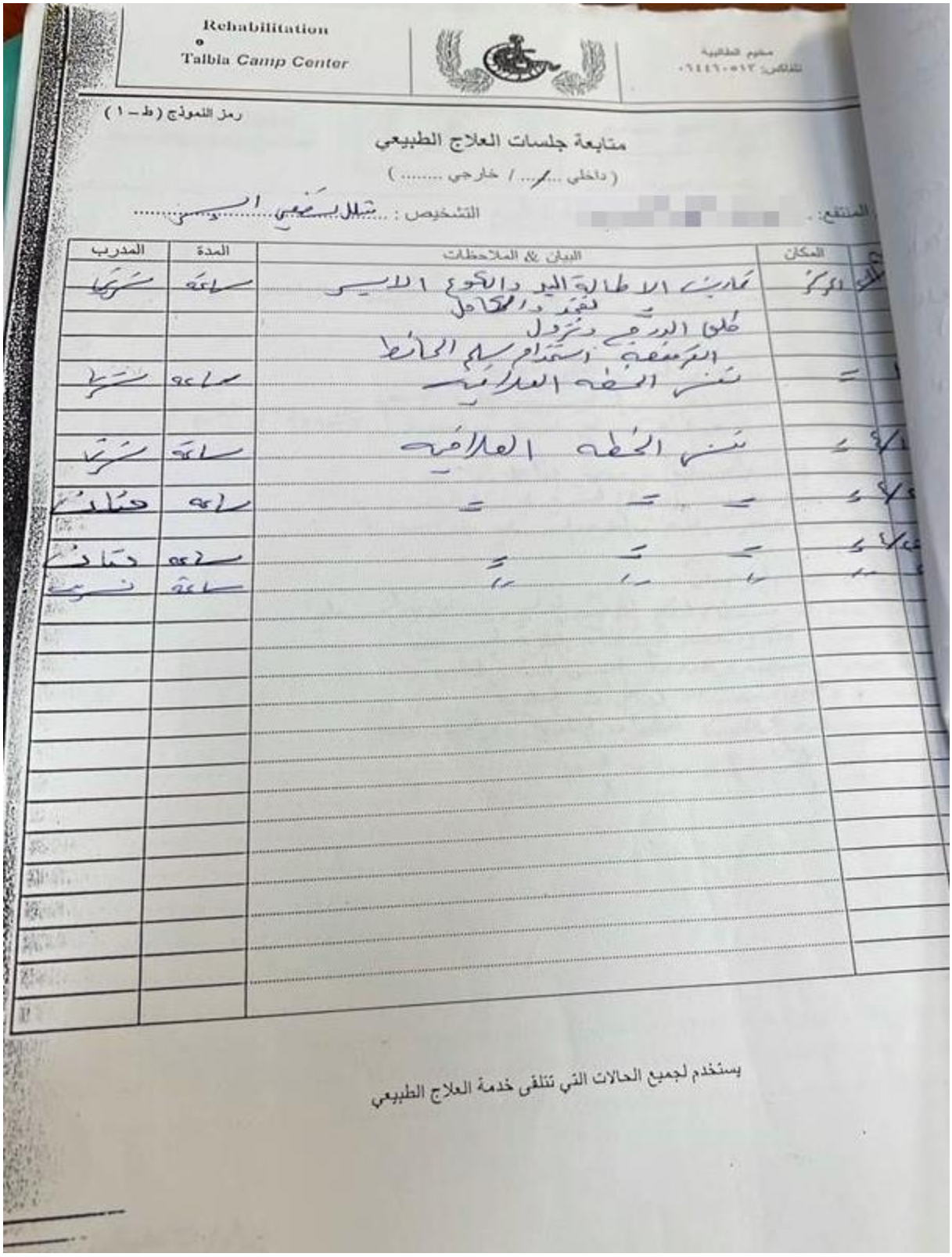
مدير مديرية صحة المرآه والطفل

الدكتور [redacted]

أخصائي الأطفال

ل ع ****

وزارة الصحة
مديرية صحة المرأة والطفل
مركز تشخيص الإعاقات المبكرة



Rehabilitation
Talbia Camp Center

مخيم الطالبية
للتواصل: ٠٦٤٤٩٠٥١٢

رمز النموذج (ط – ١)

متابعة جلسات العلاج الطبيعي

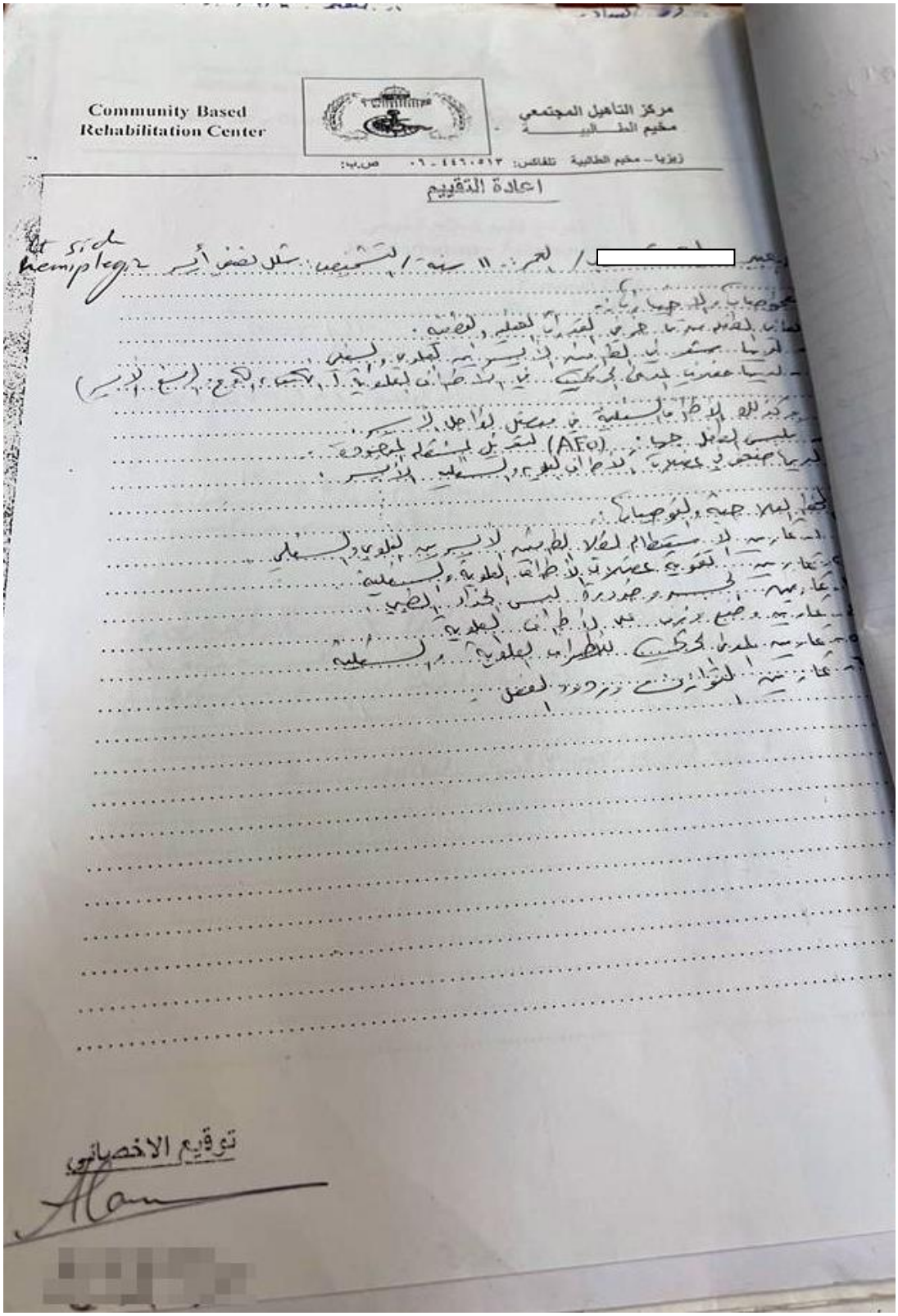
(داخلي ...✓... / خارجي .....)

المنتفع: [redacted]

التشخيص : شلل نصفي اسبستي

م	المكان	البيان & الملاحظات	المدة	المدرب
	الكرسي	تمارين الاطالة اليدوي والكوع الايسر لقعد والمحاذل	ساعة	سريتا
		طلق اليد في دنزول		
		الركبة استخدام سلم الحائط		
		تغير الضمادات	ساعة	سريتا
		تغير الضمادات	ساعة	سريتا
		" " "	ساعة	ضمادات
		" " "	ساعة	ضمادات
		" " "	ساعة	نسرين

يستخدم لجميع الحالات التي تتلقى خدمة العلاج الطبيعي



Community Based
Rehabilitation Center

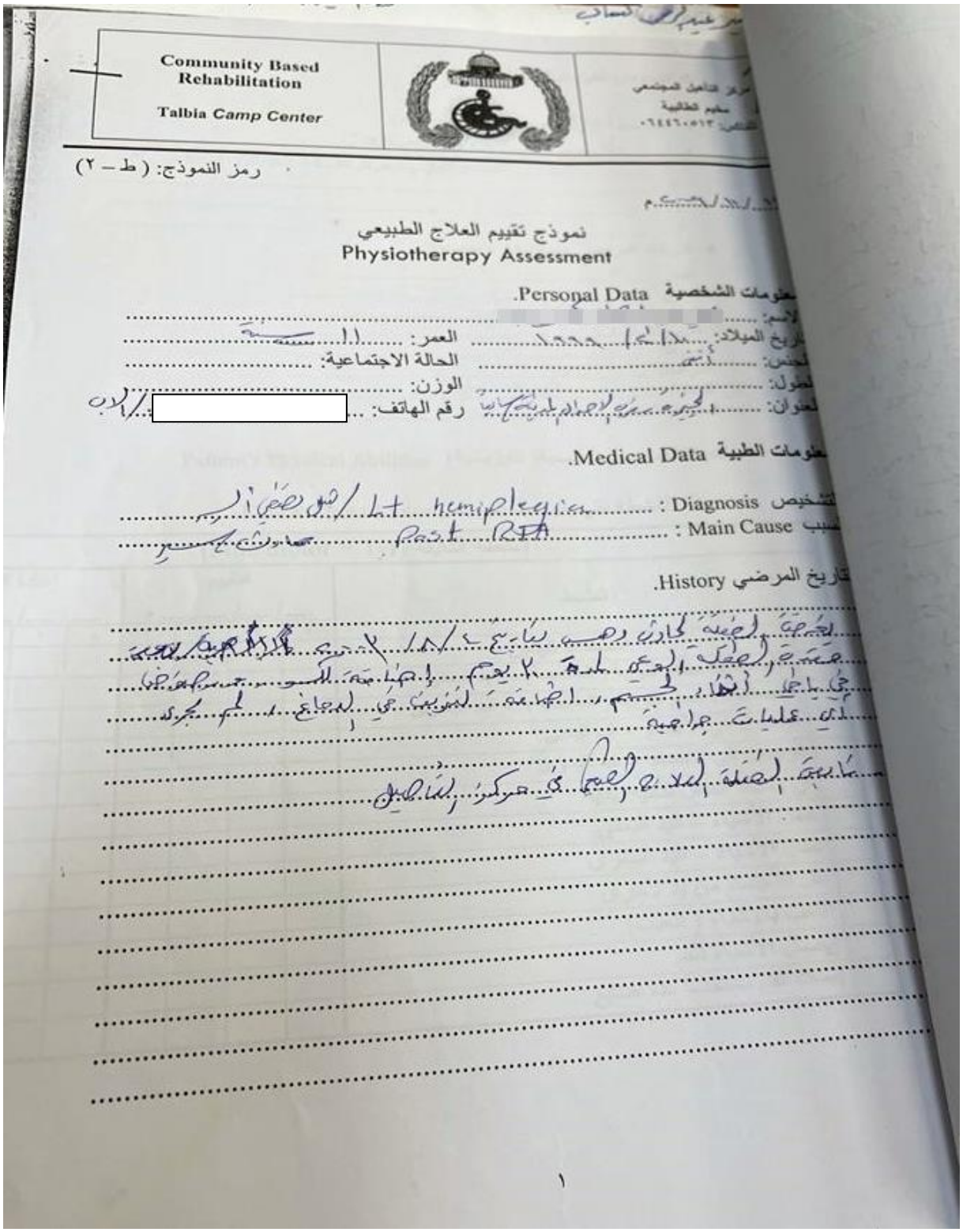
مركز التأهيل المجتمعي
مخيم الطالبية

زعتريا – مخيم الطالبية تلفاكس: ٠٦-٤٤٦٠٥١٣ ص.ب:

اعادة التقييم

Rt side hemiplegia

توقيع الاخصائي



Community Based Rehabilitation

Talbia Camp Center

رمز النموذج: (ط – ٢)

نموذج تقييم العلاج الطبيعي

Physiotherapy Assessment

المعلومات الشخصية Personal Data.

الاسم: .....

تاريخ الميلاد: ..... العمر: ١١

الجنس: ..... الحالة الاجتماعية: .....

العنوان: ..... الوزن: .....

رقم الهاتف: .....

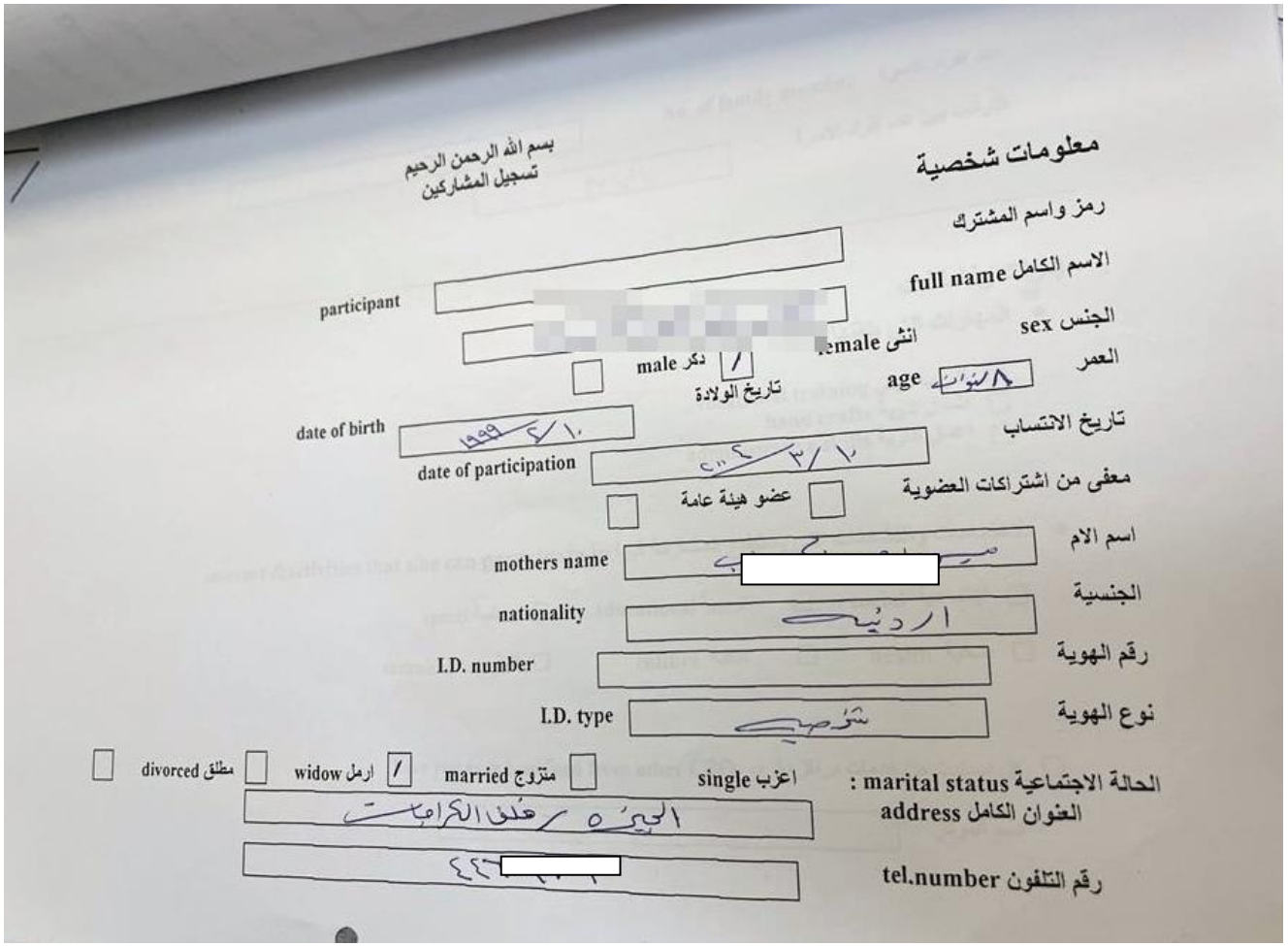
المعلومات الطبية Medical Data.

التشخيص Diagnosis : ..... Lt hemiplegia

سبب Main Cause : ..... Post RTA

تاريخ المرضي History.

١



بسم الله الرحمن الرحيم
تسجيل المشاركين

معلومات شخصية

رمز واسم المشترك participant

الاسم الكامل full name

الجنس sex — انثى female ☐ — ذكر male ☐

العمر age ٨ سنوات

تاريخ الولادة date of birth ١٠/٤/١٩٩٩

تاريخ الانتساب date of participation ٢/٤/٢٠٠٠

معفى من اشتراكات العضوية ☐ — عضو هيئة عامة ☐

اسم الام mothers name [redacted]

الجنسية nationality اردنية

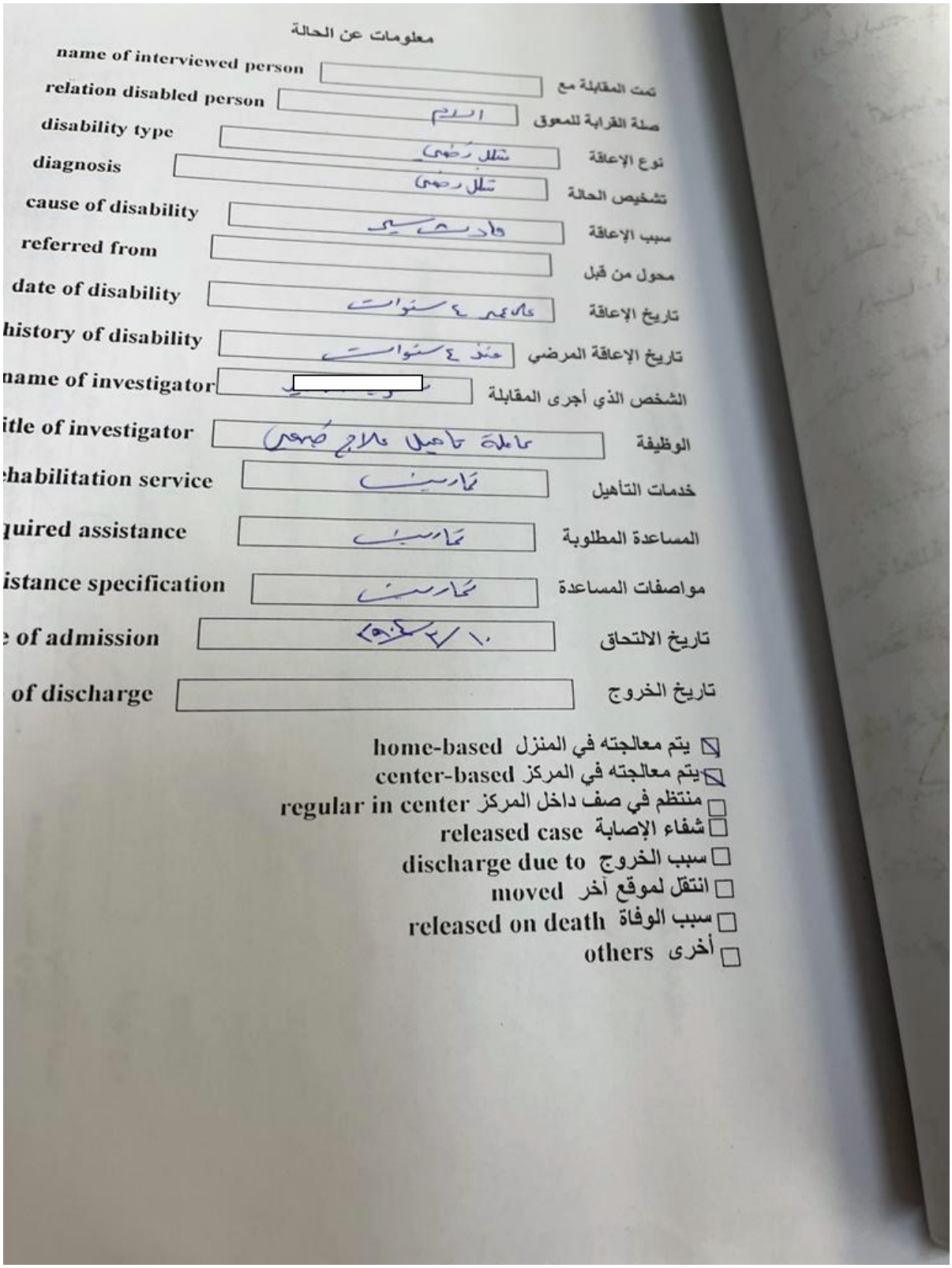
رقم الهوية I.D. number [redacted]

نوع الهوية I.D. type شخصية

الحالة الاجتماعية marital status : اعزب single ☐ — متزوج married ☐ — ارمل widow ☐ — مطلق divorced ☐

العنوان الكامل address البيرة - طلوع الكرامات

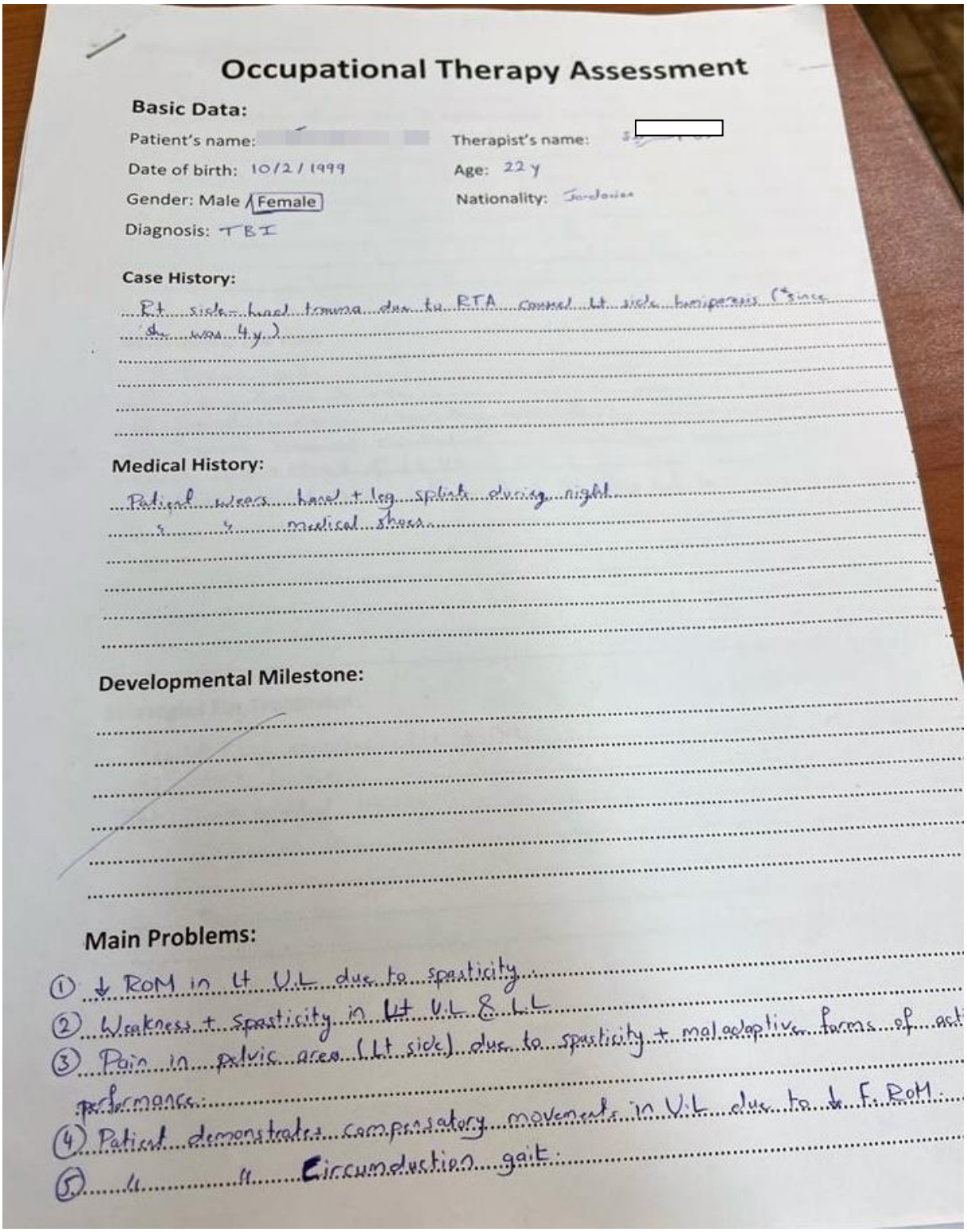
رقم التلفون tel.number [redacted]



معلومات عن الحالة

name of interviewed person	تمت المقابلة مع
relation disabled person	صلة القرابة للمعوق
disability type	نوع الإعاقة
diagnosis	تشخيص الحالة
cause of disability	سبب الإعاقة
referred from	محول من قبل
date of disability	تاريخ الإعاقة
history of disability	تاريخ الإعاقة المرضي
name of investigator	الشخص الذي أجرى المقابلة
title of investigator	الوظيفة
rehabilitation service	خدمات التأهيل
required assistance	المساعدة المطلوبة
istance specification	مواصفات المساعدة
e of admission	تاريخ الالتحاق
of discharge	تاريخ الخروج

☒ يتم معالجته في المنزل home-based
☒ يتم معالجته في المركز center-based
☐ منتظم في صف داخل المركز regular in center
☐ شفاء الإصابة released case
☐ سبب الخروج discharge due to
☐ انتقل لموقع آخر moved
☐ سبب الوفاة released on death
☐ أخرى others



Occupational Therapy Assessment

Basic Data:

Patient's name: [redacted] Therapist's name: [redacted]

Date of birth: 10/2/1999 Age: 22 y

Gender: Male / Female Nationality: Jordanian

Diagnosis: TBI

Case History:

Rt side head trauma due to RTA caused Lt side hemiparesis (since she was 4 y.)

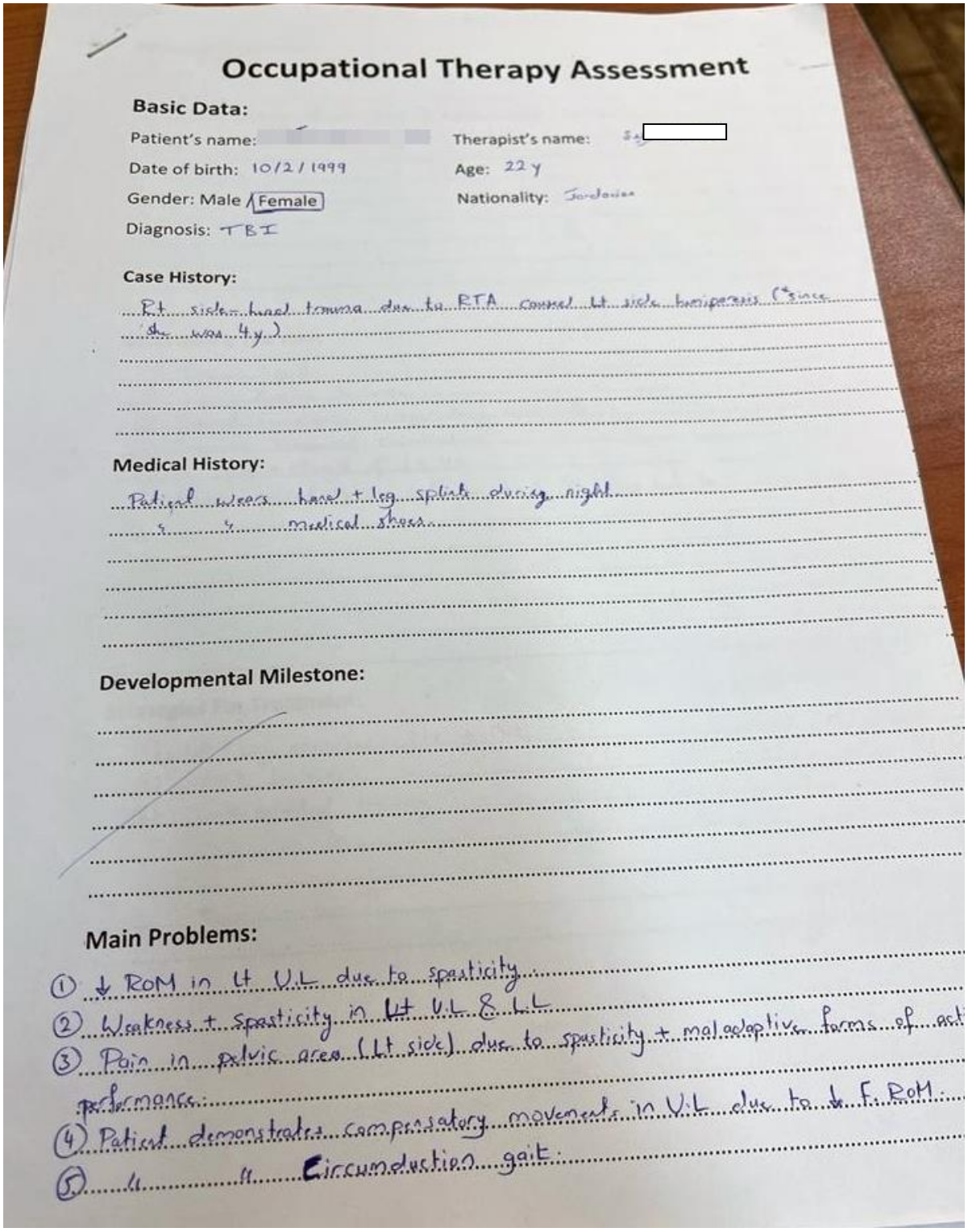
Medical History:

Patient wears hand + leg splint during night & medical shoes.

Developmental Milestone:

Main Problems:

1. ↓ RoM in Lt U.L due to spasticity
2. Weakness + Spasticity in Lt U.L & L.L
3. Pain in pelvis area (Lt side) due to spasticity + maladaptive forms of act performance
4. Patient demonstrates compensatory movements in U.L due to ↓ F. RoM
5. " " Circumduction gait



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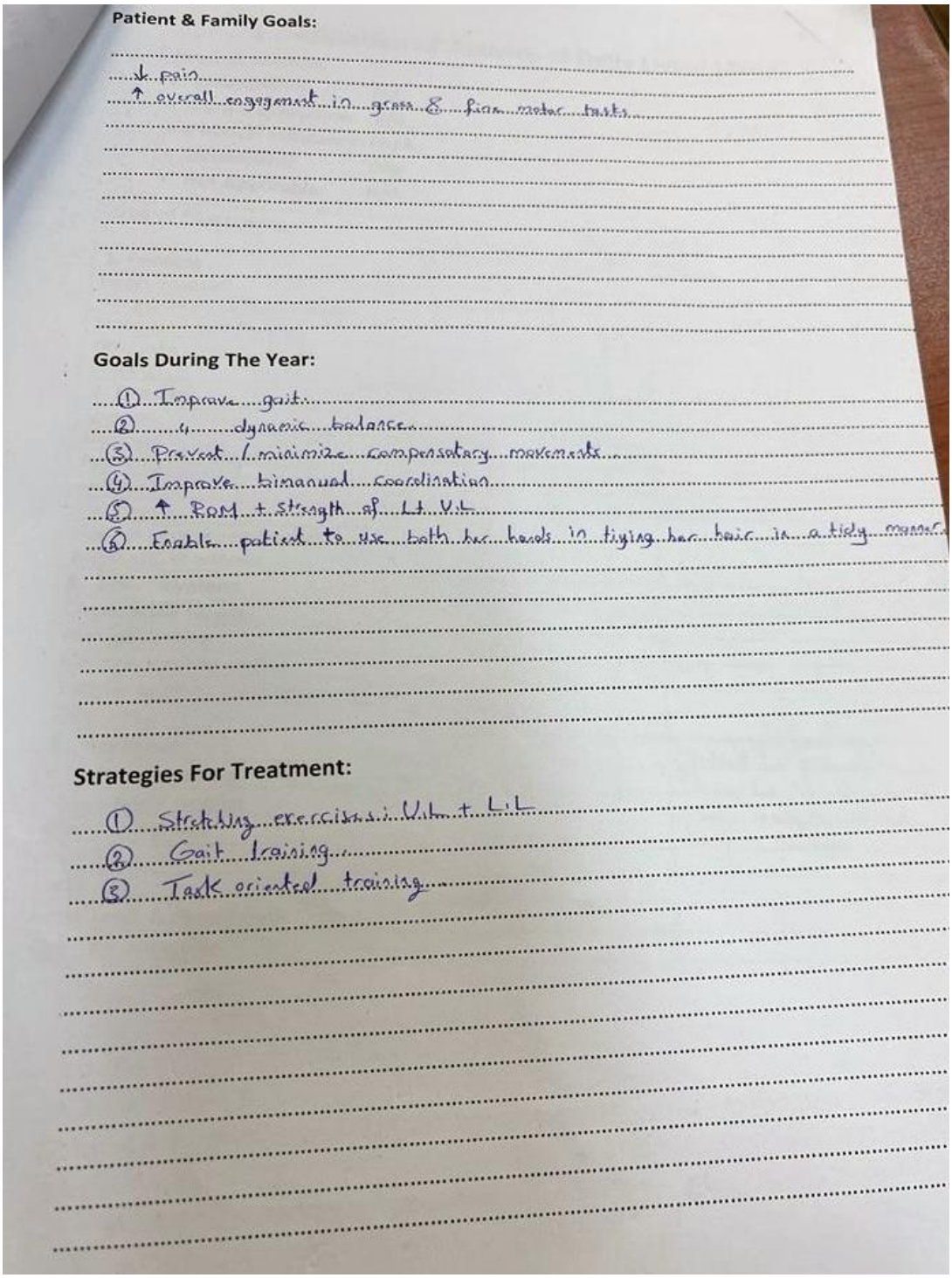


Patient & Family Goals:

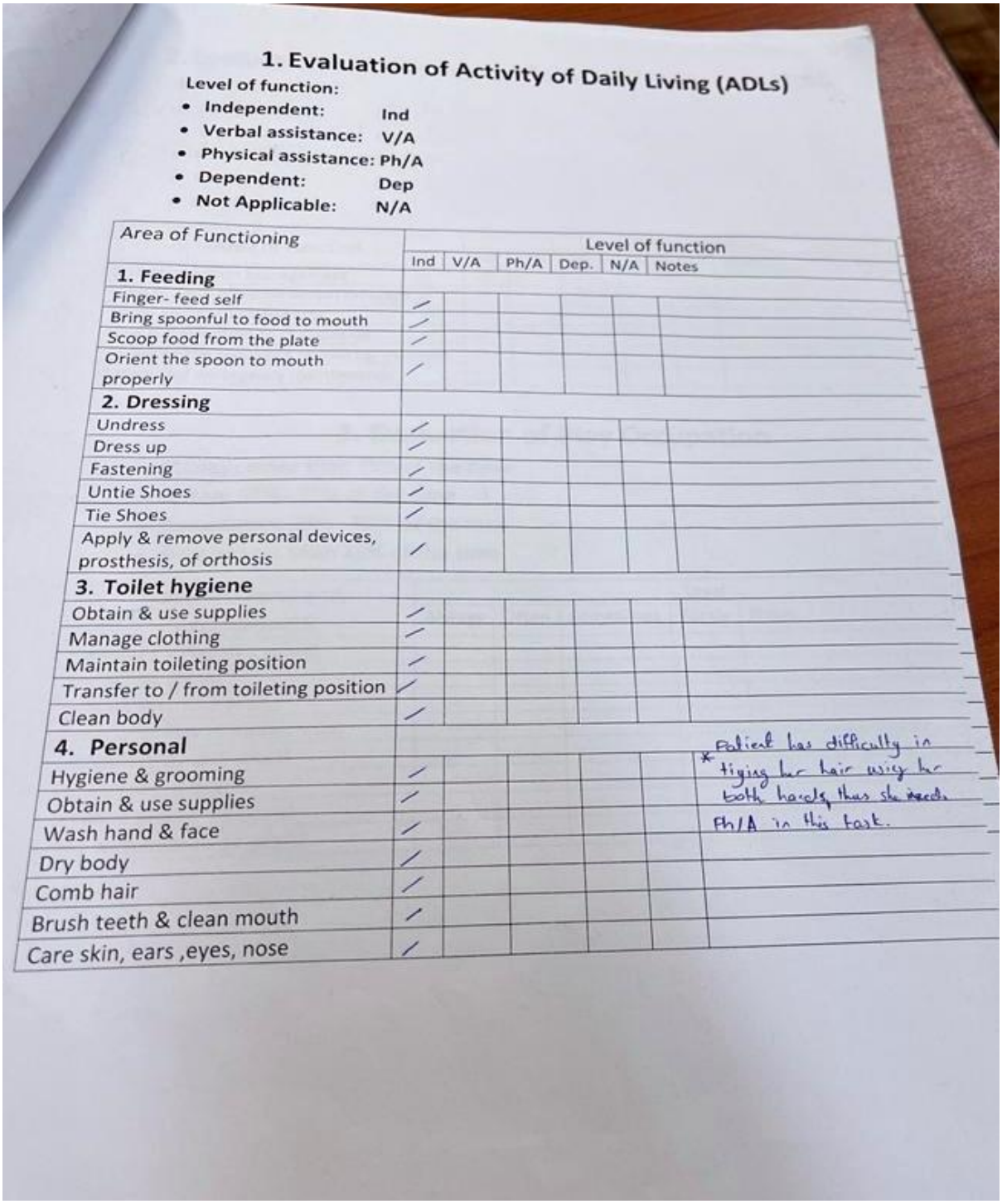
↓ pain
↑ overall engagement in gross & fine motor tasks

Goals During The Year:

① Improve gait
② ↑ dynamic balance
③ Prevent / minimize compensatory movements
④ Improve bimanual coordination
⑤ ↑ ROM + strength of Lt. U.L
⑥ Enable patient to use both her hands in tying her hair in a tidy manner

Strategies For Treatment:

① Stretching exercises : U.L + L.L
② Gait training
③ Task oriented training

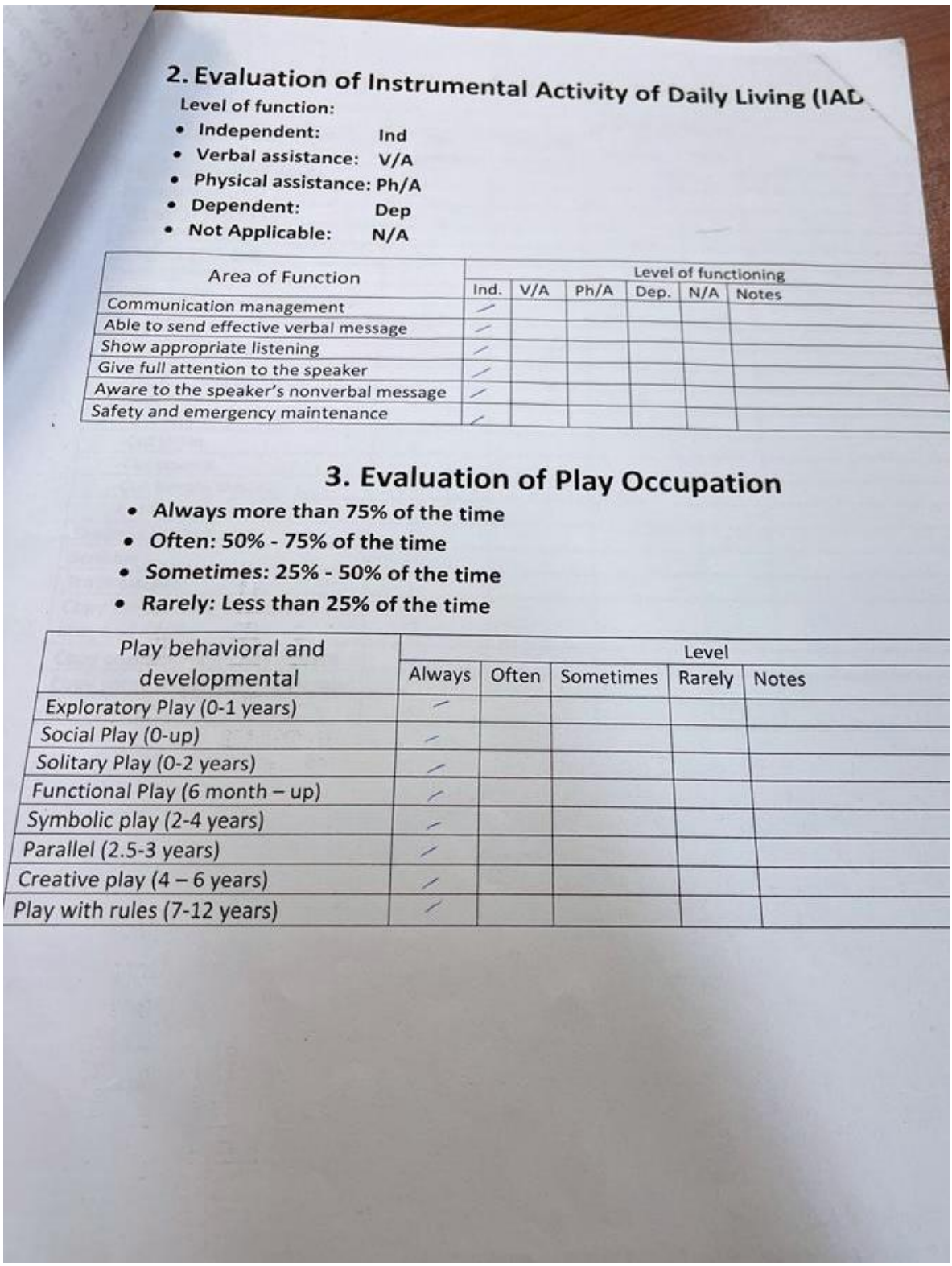


1. Evaluation of Activity of Daily Living (ADLs)

Level of function:

- **Independent:** Ind
- **Verbal assistance:** V/A
- **Physical assistance:** Ph/A
- **Dependent:** Dep
- **Not Applicable:** N/A

Area of Functioning	Level of function					
	Ind	V/A	Ph/A	Dep.	N/A	Notes
1. Feeding						
Finger- feed self	/					
Bring spoonful to food to mouth	/					
Scoop food from the plate	/					
Orient the spoon to mouth properly	/					
2. Dressing						
Undress	/					
Dress up	/					
Fastening	/					
Untie Shoes	/					
Tie Shoes	/					
Apply & remove personal devices, prosthesis, of orthosis	/					
3. Toilet hygiene						
Obtain & use supplies	/					
Manage clothing	/					
Maintain toileting position	/					
Transfer to / from toileting position	/					
Clean body	/					
4. Personal						* Patient has difficulty in tying her hair using her both hands, thus she needs Ph/A in this task.
Hygiene & grooming	/					
Obtain & use supplies	/					
Wash hand & face	/					
Dry body	/					
Comb hair	/					
Brush teeth & clean mouth	/					
Care skin, ears ,eyes, nose	/					



2. Evaluation of Instrumental Activity of Daily Living (IAD

Level of function:

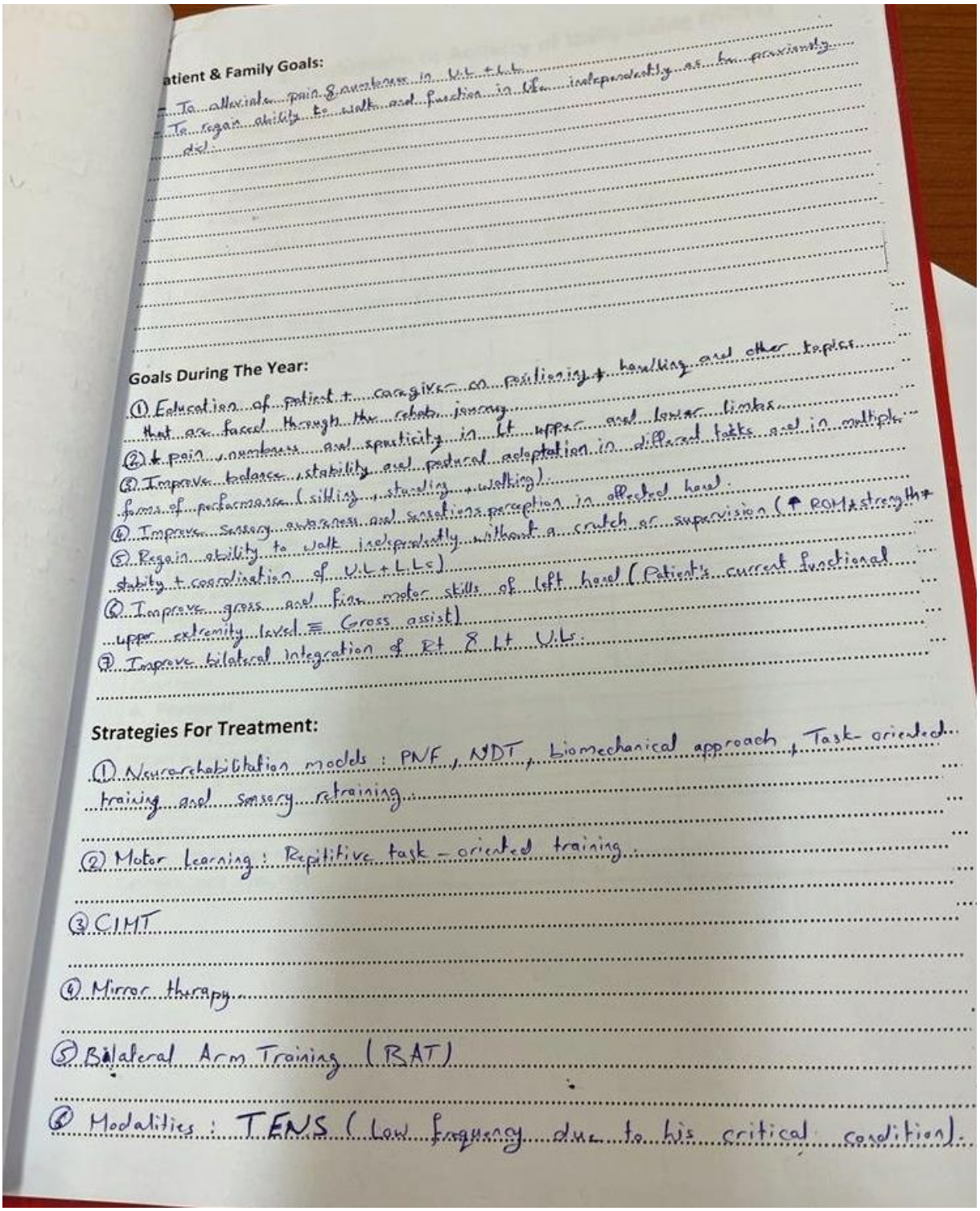
- Independent: Ind
- Verbal assistance: V/A
- Physical assistance: Ph/A
- Dependent: Dep
- Not Applicable: N/A

Area of Function	Level of functioning					
	Ind.	V/A	Ph/A	Dep.	N/A	Notes
Communication management	/					
Able to send effective verbal message	/					
Show appropriate listening	/					
Give full attention to the speaker	/					
Aware to the speaker's nonverbal message	/					
Safety and emergency maintenance	/					

3. Evaluation of Play Occupation

- **Always more than 75% of the time**
- **Often: 50% - 75% of the time**
- **Sometimes: 25% - 50% of the time**
- **Rarely: Less than 25% of the time**

Play behavioral and developmental	Level				
	Always	Often	Sometimes	Rarely	Notes
Exploratory Play (0-1 years)	/				
Social Play (0-up)	/				
Solitary Play (0-2 years)	/				
Functional Play (6 month – up)	/				
Symbolic play (2-4 years)	/				
Parallel (2.5-3 years)	/				
Creative play (4 – 6 years)	/				
Play with rules (7-12 years)	/				



atient & Family Goals:

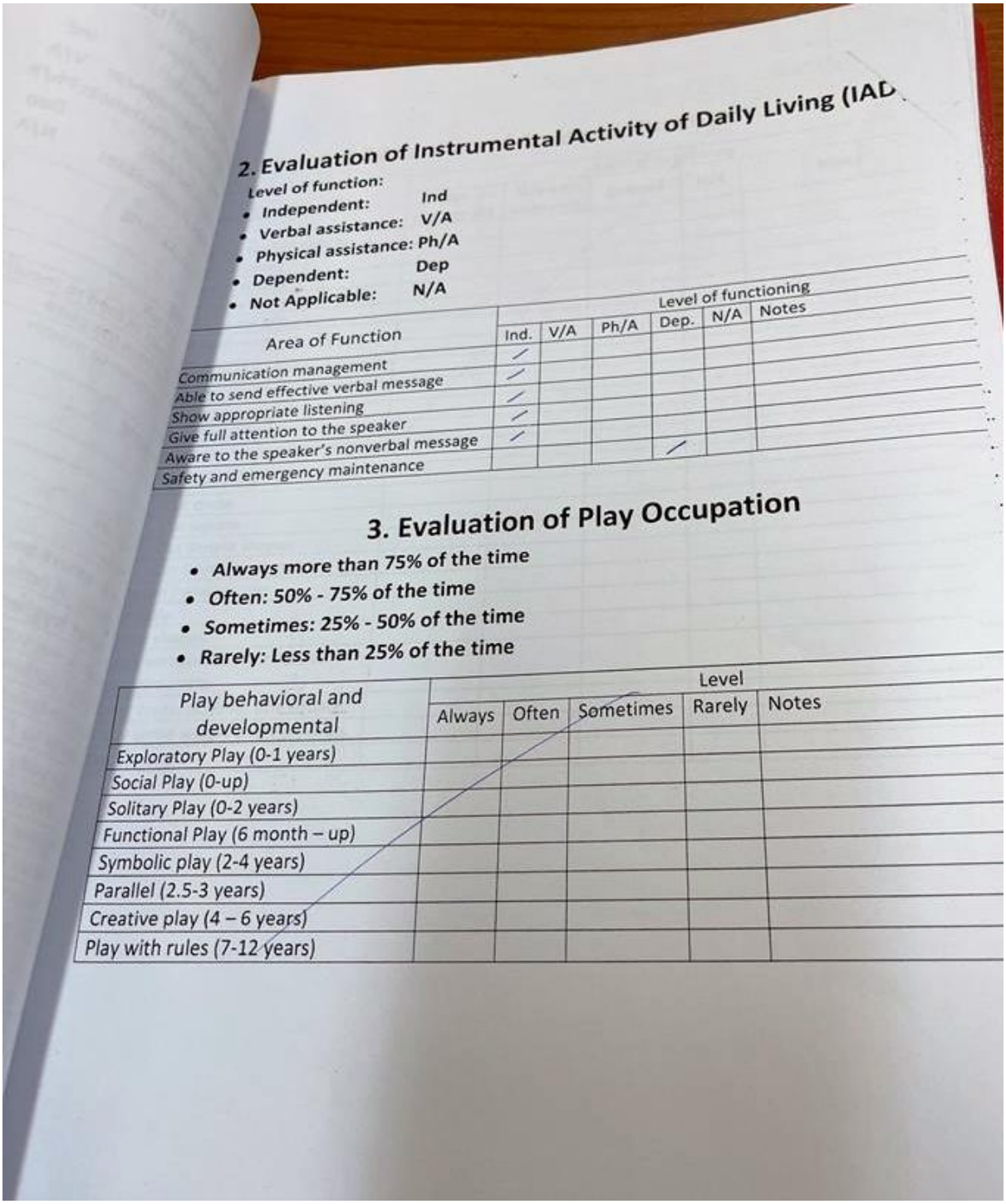
- To alleviate pain & weakness in Lt + Lt
- To regain ability to walk and function in the independently as he previously did.

Goals During The Year:

① Education of patient + caregiver on positioning + handling and other topics that are faced through the rehab journey.
② ↓ pain, numbness and spasticity in Lt upper and lower limbs.
③ Improve balance, stability and postural adaptation in different tasks and in multiple forms of performance (sitting, standing, walking).
④ Improve sensory awareness and sensations perception in affected hand.
⑤ Regain ability to walk independently without a crutch or supervision (↑ ROM + strength + stability + coordination of U.L + L.Ls)
⑥ Improve gross and fine motor skills of left hand (Patient's current functional upper extremity level = Gross assist)
⑦ Improve bilateral integration of Rt & Lt U.Ls.

Strategies For Treatment:

① Neurorehabilitation models : PNF, NDT, biomechanical approach, Task-oriented training and sensory retraining.
② Motor learning : Repititive task-oriented training.
③ CIMT
④ Mirror therapy
⑤ Bilateral Arm Training (BAT)
⑥ Modalities : TENS (Low frequency due to his critical condition).



2. Evaluation of Instrumental Activity of Daily Living (IAD

Level of function:

- **Independent:** Ind
- **Verbal assistance:** V/A
- **Physical assistance:** Ph/A
- **Dependent:** Dep
- **Not Applicable:** N/A

Area of Function	Level of functioning					
	Ind.	V/A	Ph/A	Dep.	N/A	Notes
Communication management	/					
Able to send effective verbal message	/					
Show appropriate listening	/					
Give full attention to the speaker	/					
Aware to the speaker's nonverbal message	/					
Safety and emergency maintenance				/		

3. Evaluation of Play Occupation

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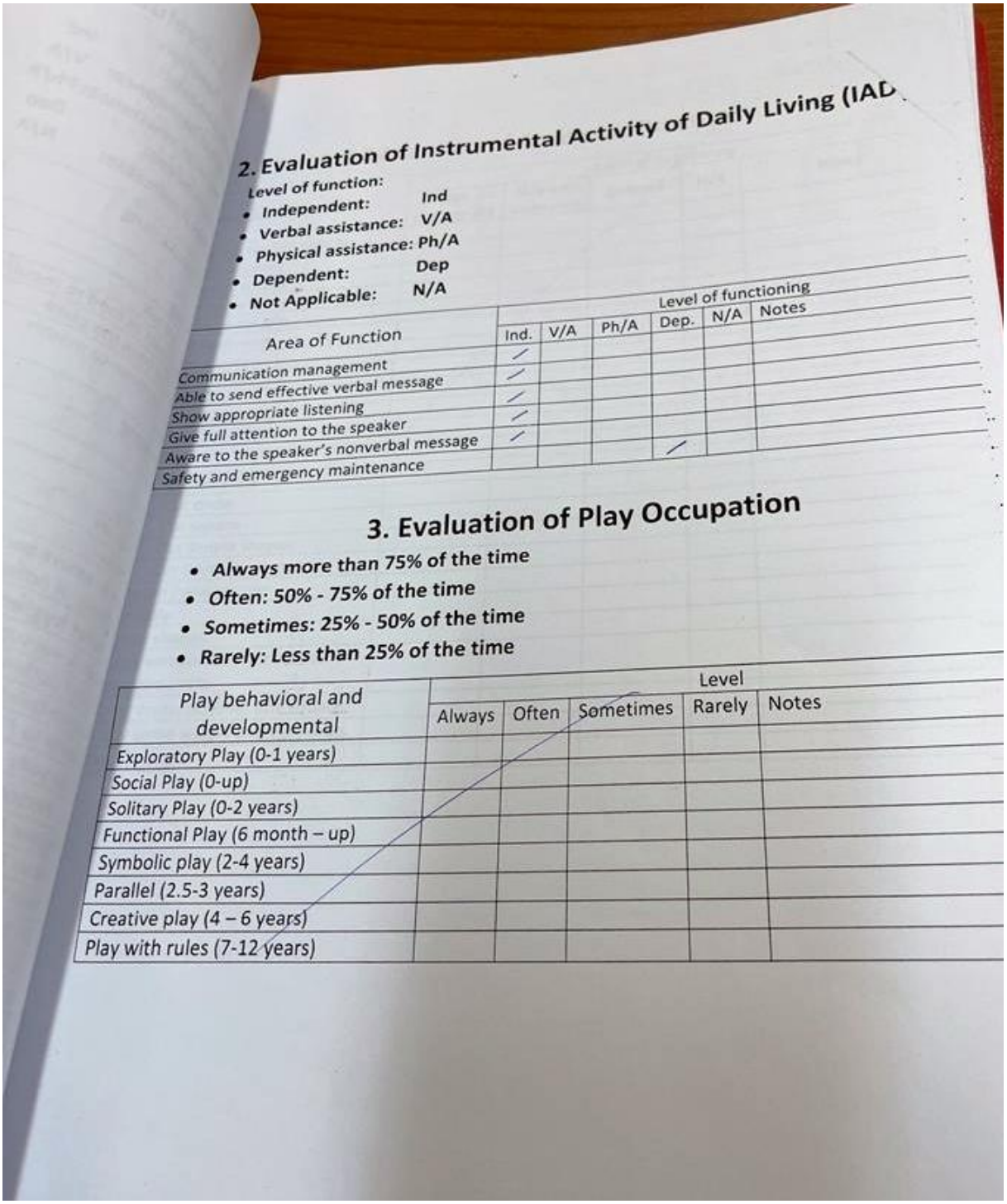
Creative play (4 – 6 years)					
Play with rules (7-12 years)					



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Level of function:

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- **Physical assistance:** Ph/A
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	Ind.	V/A	Ph/A	Dep.	N/A	Notes
Communication management						
Able to send effective verbal message	/					
Show appropriate listening	/					
Give full attention to the speaker	/					
Aware to the speaker's nonverbal message	/					
Safety and emergency maintenance				/		

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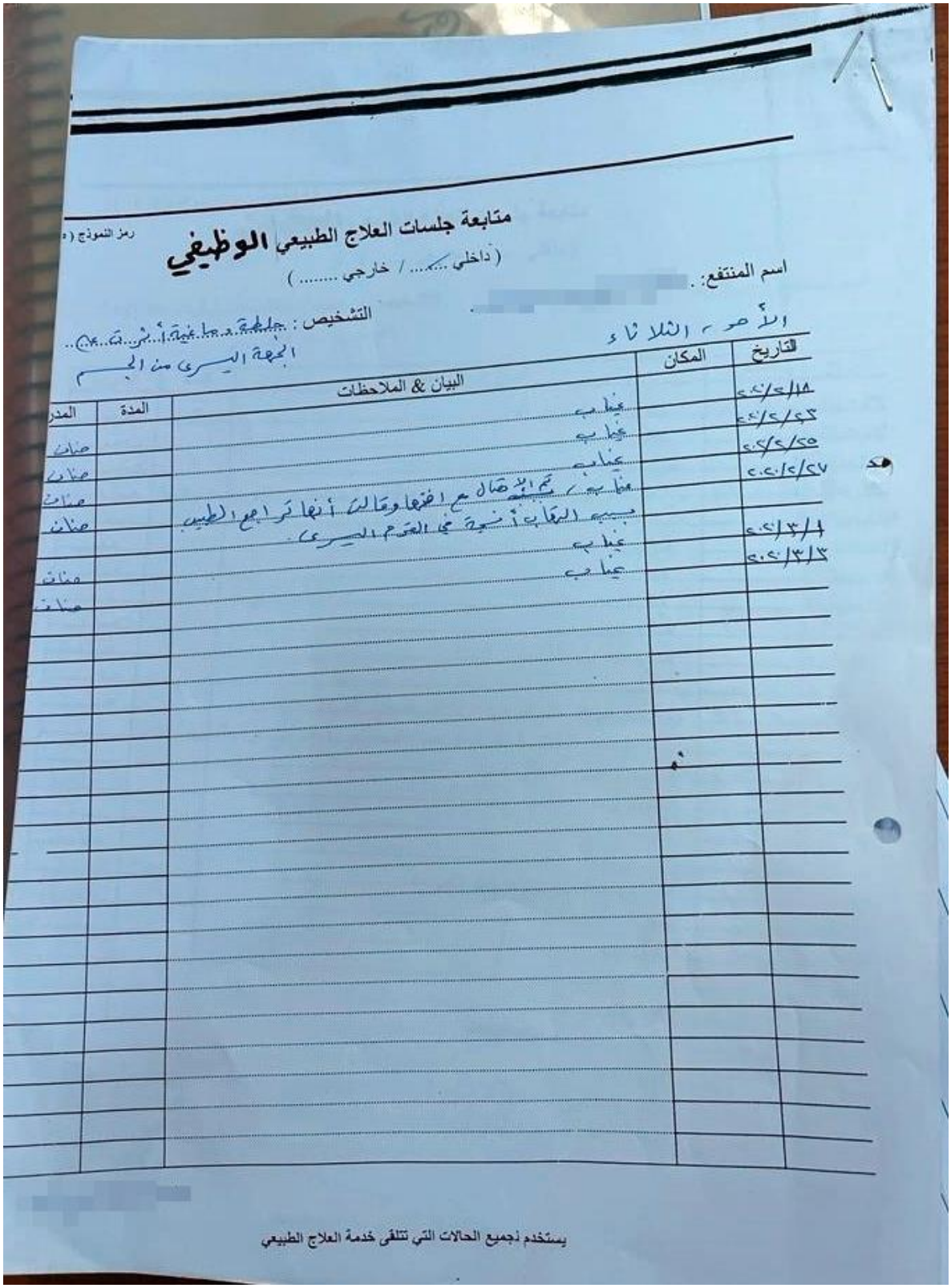
Play with rules (7-12 years)					



رمز النموذج (

متابعة جلسات العلاج الطبيعي الوظيفي

(داخلي ..... / خارجي .....)

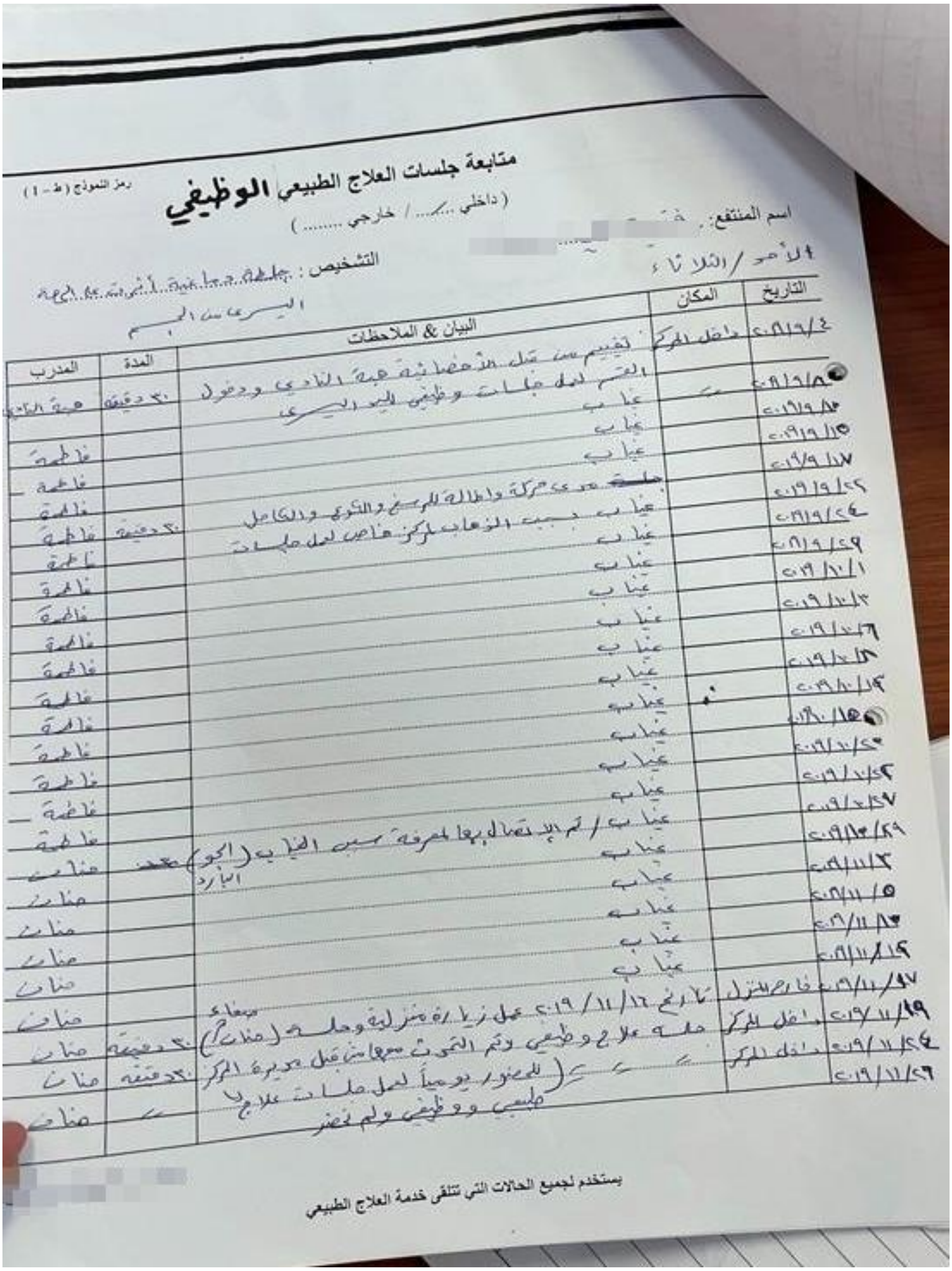
اسم المنتفع: .

التشخيص : جلطة أثناء الدماغ

الجهة اليسرى من الجسم

الأحد - الثلاثاء

التاريخ	المكان	البيان & الملاحظات	المدة	المدر
٢٠٢٤/٤/٢٨		غياب		صباح
٢٠٢٤/٤/٣٠		غياب		صباح
٢٠٢٤/٥/٥		غياب		صباح
٢٠٢٤/٥/٧		حضر ، تم الاتصال معها وقالت أنها تراجع الطبيب بسبب التهاب أنسجة في العضم اليسرى		صباح
٢٠٢٤/٣/١		غياب		صباح
٢٠٢٤/٣/٣		غياب		صباح



رمز النموذج (ط - ١)

متابعة جلسات العلاج الطبيعي الوظيفي

(داخلي ...✓... / خارجي ....)

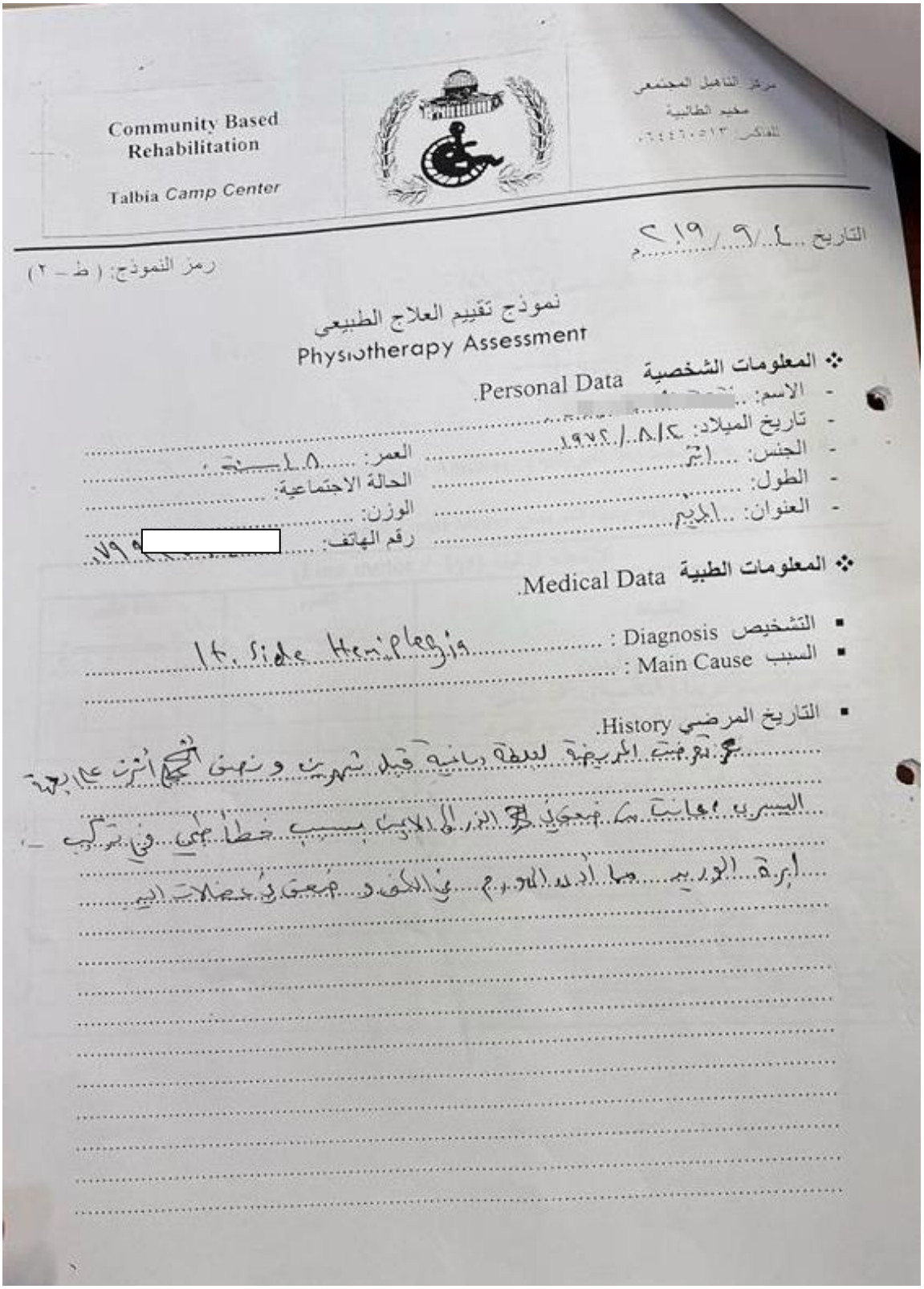
اسم المنتفع:

الأحد / الثلاثاء

التشخيص : جلطة دماغية أثرت على الجهة اليسرى من الجسم

التاريخ	المكان	البيان & الملاحظات	المدة	المدرب
٢٠١٩/٩/٤	داخل المركز	تقييم من قبل الأخصائية هبة النادي		
٢٠١٩/٩/٨	=	العضو لعمل جلسات وظيفي لليد اليسرى ودخول	٣٠ دقيقة	هبة النادي
٢٠١٩/٩/١٠		غياب		
٢٠١٩/٩/١٥		غياب		
٢٠١٩/٩/١٧		غياب		فاطمة
٢٠١٩/٩/٢٢		جلسة مدى حركة وإطالة للرسغ والكوع والكاحل		فاطمة
٢٠١٩/٩/٢٤		غياب بسبب الذهاب لمركز خاص لعمل جلسات	٣٠ دقيقة	فاطمة
٢٠١٩/٩/٢٩		غياب		فاطمة
٢٠١٩/١٠/١		غياب		فاطمة
٢٠١٩/١٠/٣		غياب		فاطمة
٢٠١٩/١٠/٦		غياب		فاطمة
٢٠١٩/١٠/٨		غياب		فاطمة
٢٠١٩/١٠/١٣		غياب		فاطمة
٢٠١٩/١٠/١٥		غياب		فاطمة
٢٠١٩/١٠/٢٠		غياب		فاطمة
٢٠١٩/١٠/٢٢		غياب		فاطمة
٢٠١٩/١٠/٢٧		غياب		فاطمة
٢٠١٩/١٠/٢٩		غياب / تم الاتصال بها لمعرفة سبب الغياب (الجو البارد)		فاطمة
٢٠١٩/١١/٣		غياب		منال
٢٠١٩/١١/٥		غياب		منال
٢٠١٩/١١/١٠		غياب		منال
٢٠١٩/١١/١٢		غياب		منال
٢٠١٩/١١/١٧		غياب		منال
٢٠١٩/١١/١٩	خارج المنزل	بتاريخ ٢٠١٩/١١/١٦ عمل زيارة منزلية وجلسة (منال)		منال
٢٠١٩/١١/٢٤	داخل المركز	جلسة علاج وظيفي وتم التحدث معها من قبل مديرة المركز	٣٠ دقيقة	منال
٢٠١٩/١١/٢٦	داخل المركز	للحضور يومياً لعمل جلسات علاج طبيعي ووظيفي ولم تحضر	٣٠ دقيقة	منال

يستخدم لجميع الحالات التي تتلقى خدمة العلاج الطبيعي



Community Based Rehabilitation

Talbia Camp Center

مركز التأهيل المجتمعي
مخيم الطالبية

التاريخ ٢٠١٩/٩/٤م

رمز النموذج: (ط – ٢)

نموذج تقييم العلاج الطبيعي
Physiotherapy Assessment

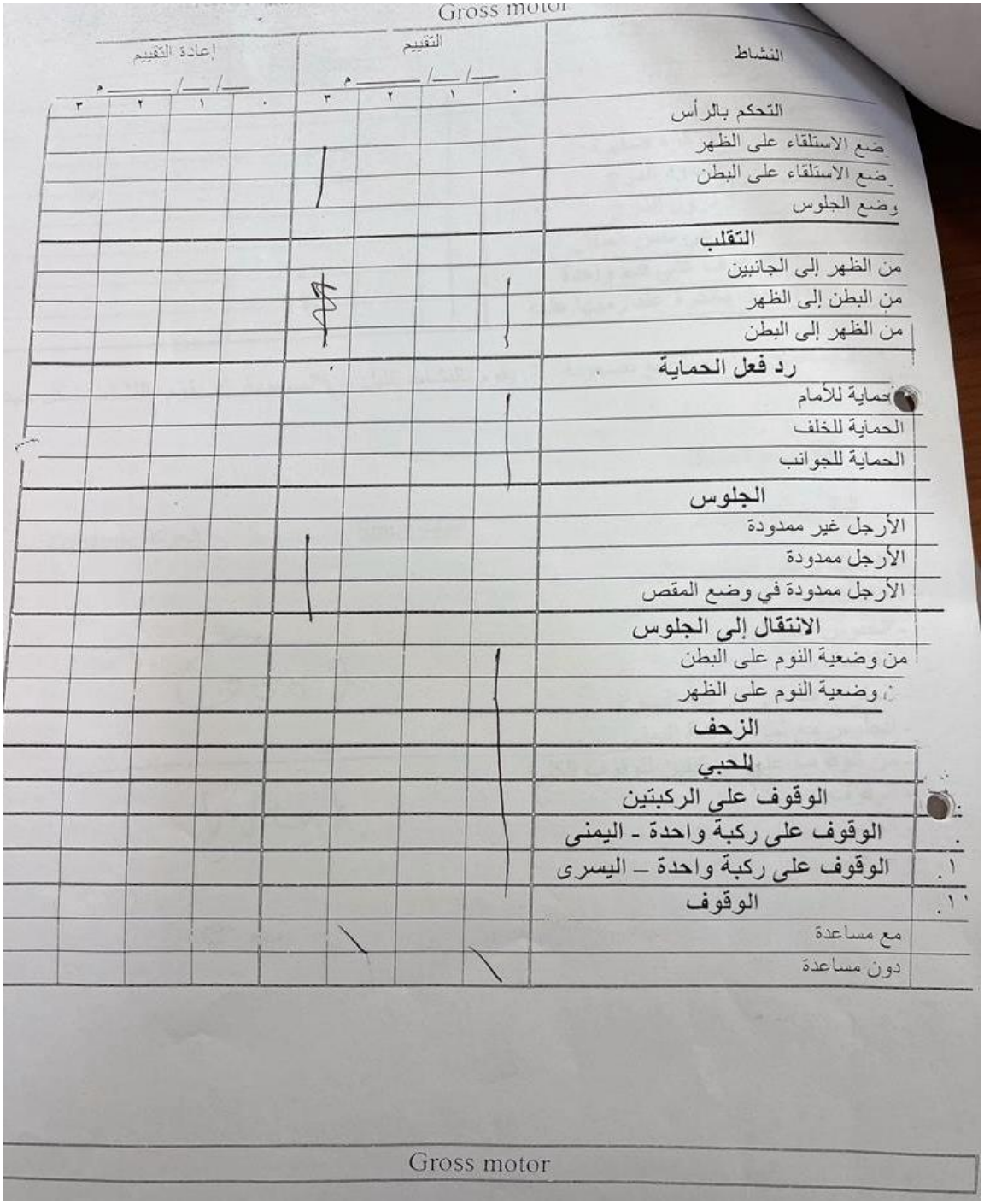
❖ المعلومات الشخصية Personal Data.

- الاسم: [redacted]
- تاريخ الميلاد: ١٩٧٢/٨/١٤ العمر: ٤٧ سنة
- الجنس: انثى الحالة الاجتماعية:
- الطول: الوزن:
- العنوان: الديم رقم الهاتف: [redacted]

❖ المعلومات الطبية Medical Data.

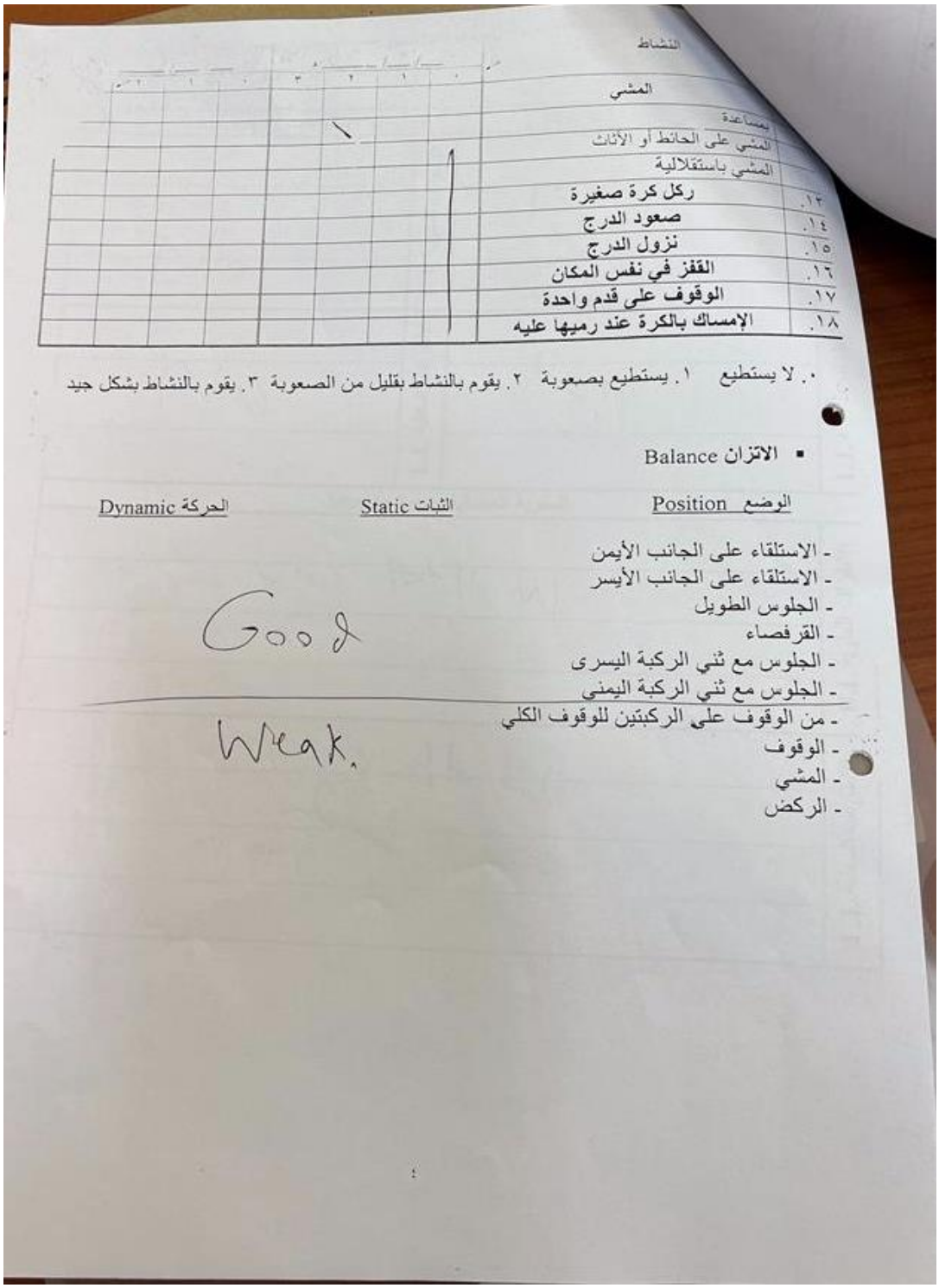
- التشخيص Diagnosis : Lt. Side Hemiplegia
- السبب Main Cause :
- التاريخ المرضي History.

تعرضت المريضة لجلطة دماغية قبل شهرين ونصف الحالة أثرت على الجهة اليسرى وإصابتها في جهاز الدوران الأيمن بسبب خطأ طبي في تركيب إبرة الوريد ما أدى للورم في الكف وتعرض لخضلات اليد



Gross motor

النشاط	التقييم ___/___/___ م				إعادة التقييم ___/___/___ م			
	٠	١	٢	٣	٠	١	٢	٣
التحكم بالرأس								
وضع الاستلقاء على الظهر								
وضع الاستلقاء على البطن								
وضع الجلوس								
التقلب								
من الظهر إلى الجانبين								
من البطن إلى الظهر								
من الظهر إلى البطن								
رد فعل الحماية								
الحماية للأمام								
الحماية للخلف								
الحماية للجوانب								
الجلوس								
الأرجل غير ممدودة								
الأرجل ممدودة								
الأرجل ممدودة في وضع المقص								
الانتقال إلى الجلوس								
من وضعية النوم على البطن								
وضعية النوم على الظهر								
الزحف								
الحبي								
الوقوف على الركبتين								
الوقوف على ركبة واحدة - اليمنى								
الوقوف على ركبة واحدة – اليسرى								
الوقوف								
مع مساعدة								
دون مساعدة								



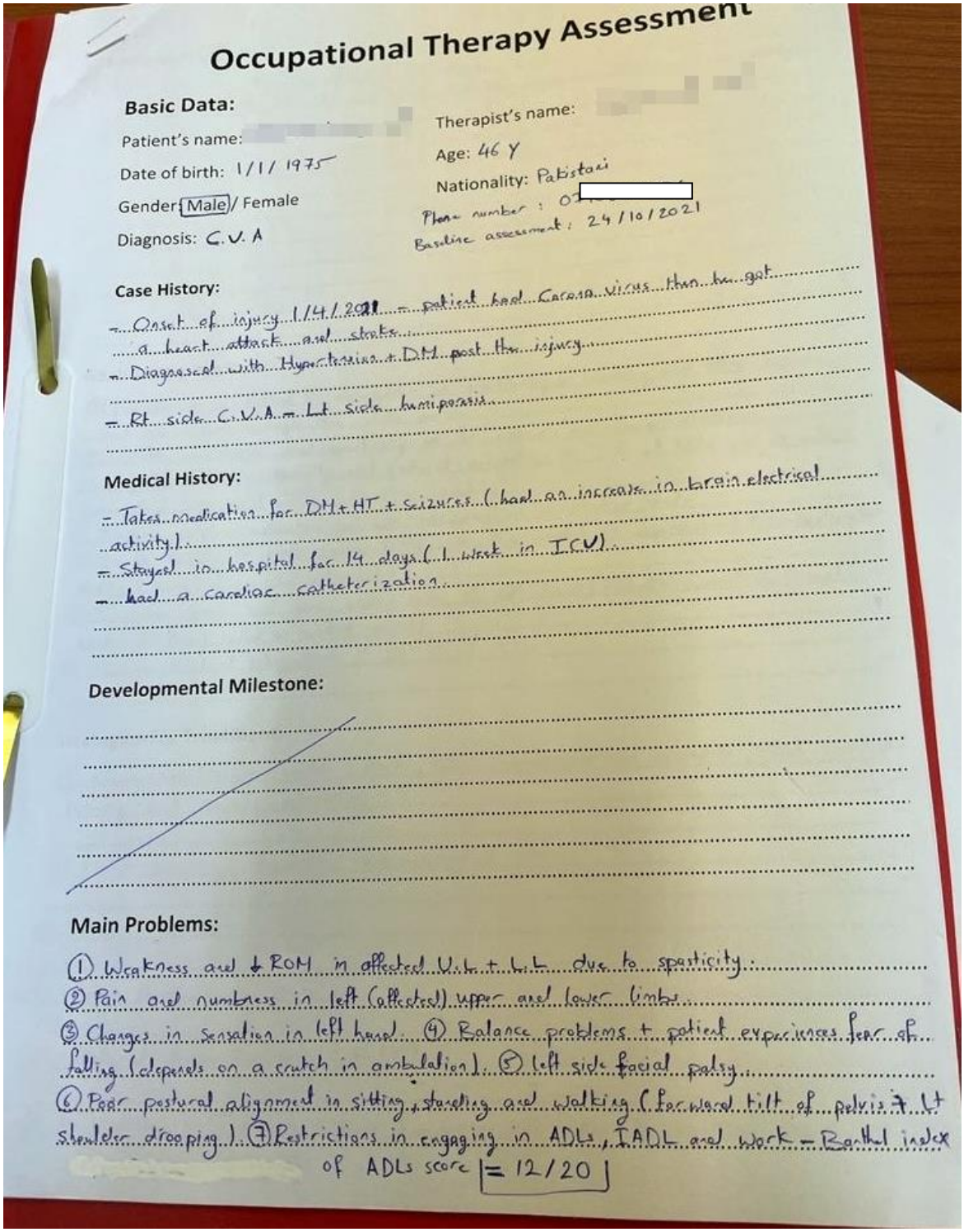
النشاط

	المشي
	بمساعدة
	المشي على الحائط أو الأثاث
	المشي باستقلالية
.١٢	ركل كرة صغيرة
.١٤	صعود الدرج
.١٥	نزول الدرج
.١٦	القفز في نفس المكان
.١٧	الوقوف على قدم واحدة
.١٨	الإمساك بالكرة عند رميها عليه

٠. لا يستطيع ١. يستطيع بصعوبة ٢. يقوم بالنشاط بقليل من الصعوبة ٣. يقوم بالنشاط بشكل جيد

- الاتزان Balance

الوضع Position	الثبات Static	الحركة Dynamic
- الاستلقاء على الجانب الأيمن		
- الاستلقاء على الجانب الأيسر		
- الجلوس الطويل	Good	
- القرفصاء		
- الجلوس مع ثني الركبة اليسرى		
- الجلوس مع ثني الركبة اليمنى		
- من الوقوف على الركبتين للوقوف الكلي	Weak.	
- الوقوف		
- المشي		
- الركض		



Occupational Therapy Assessment

Basic Data:

Patient's name:

Therapist's name:

Date of birth: 1/1/1975

Age: 46 Y

Gender [Male] / Female

Nationality: Pakistani

Diagnosis: C.V.A

Phone number : 07[redacted]

Baseline assessment: 24/10/2021

Case History:

- Onset of injury 1/4/2021 - patient had Corona virus then he got a heart attack and stroke.
- Diagnosed with Hypertension + DM post the injury.
- Rt side C.V.A - Lt side hemiparesis.

Medical History:

- Takes medication for DM + HT + seizures (had an increase in brain electrical activity).
- Stayed in hospital for 14 days (1 week in ICU).
- had a cardiac catheterization.

Developmental Milestone:

Main Problems:

① Weakness and ↓ ROM in affected U.L + L.L due to spasticity. ② Pain and numbness in left (affected) upper and lower limbs. ③ Changes in sensation in left hand. ④ Balance problems + patient experiences fear of falling (depends on a crutch in ambulation). ⑤ left side facial palsy. ⑥ Poor postural alignment in sitting, standing and walking (forward tilt of pelvis + Lt shoulder drooping). ⑦ Restrictions in engaging in ADLs, IADL and work - Barthel index of ADLs score [= 12/20]