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A pilot study on a client with aphasia

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Abstract

Aphasia is an acquired impairment in language production and comprehension and in other cognitive processes that underline language. Aphasia can be caused by any condition that damages the brain. It can also be caused by problems that disrupt the brain's functions. Aphasia is classified as Fluent and Non-fluent Aphasia on the basis of language characteristics.

This present study is pilot study on a client with non-fluent Aphasia. The client was diagnosed with Broca's Aphasia, post brain injury. After continuous speech and language therapy the client was diagnosed as Transcortical Motor Aphasia. The therapy techniques used were melodic intonation therapy, visual action therapy, and script training. The changes might be due to the neuronal changes that takes place in the brain after brain damage.

Keywords: Aphasia, Neuro-anatomy, melodic intonation therapy, visual action therapy, neuronal sprouting, Broca's aphasia, Transcortical motor aphasia

Introduction

Aphasia is an acquired impairment in language production and comprehension and in other cognitive processes that underline language. It is secondary to brain damage and is most frequently caused by stroke. [Murray and Chapey, 2001] ^[15].

The term "aphasia" refers to a family of clinically diverse disorders that affect the ability to communicate by oral or written language, or both, following brain damage. Aphasia is an umbrella concept combining a multiplicity of deficit involving one or more aspects of language use. [Understanding aphasia; 1993 by Goodglass, Harold] ^[13].

Aphasia Is created by damage to area of the human brain that are intimately involved in dealing not only with linguistic operation, but also with the nervous system areas that are intertwined with thinking, memory, control of information processing, and other cognitive function. (ADAM, US. National Library of Medicine, 2002) ^[1].

Causes: Aphasia can be caused by any condition that damages the brain. It can also be caused by problems that disrupt the brain's functions.

Possible causes for Aphasia include: Alzheimer's disease: A progressive disease that destroys memory and other important mental functions.

Aneurysms: A ballooning and weakened area in an artery, occurring in the aorta, brain, back of the knee, intestine or spleen.

Brain surgery: Medical speciality concerned with the surgical treatment of disorders which affect any portion of the nervous system including brain, spinal cord and peripheral nervous system.

Cerebral hypoxia: A neurological condition that happens when the brain doesn't get enough oxygen, even though there is good blood flow.

Concussion: A brain injury caused by a blow to the head or a violent shaking of the head and body.

Traumatic brain injury: Brain dysfunction caused by an outside force, usually a violent blow to the head. Often occurs due to severe sports injury or car accident.

Dementia and fronto-temporal dementia: A group of thinking and social symptoms that interferes with daily functioning. Fronto-temporal is an uncommon type of dementia that causes problems with behavior and language.

Developmental disorders and congenital disorders: Developmental disorder means a severe chronic disability of an individual that is attributable to a mental or physical impairment, or combination of mental and physical impairment. Congenital disorders are often inherited medical condition that occurs at or before birth.

Epilepsy or seizures: A disorder in which nerve cell activity in the brain is distributed, causing seizures (a burst of uncontrolled electrical activity between brain cells that causes temporary abnormalities in muscle tone or movements).

Genetic disorders: An inherited medical condition caused by a DNA abnormality.

Inflammation of your brain: Often due to infection. Infection caused by bacterial or viral.

Migraines: A headache of varying intensity, often accompanied by nausea and sensitivity to light and sound.

Radiation therapy or chemotherapy: Both are a type of cancer treatment that uses beams of intense energy to kill cancer cell

Toxins and poisons: Aphasia can be caused by toxins and poisons.

Stroke or transient ischemic attacks: It is a damage to the brain from interruption of its blood supply.

Characteristics

Characteristics vary depending on the type of aphasia. The severity depends on the extent of the area of the brain affected. A person with aphasia may:

Have slow effortful speech, speak in short or incomplete sentences and omit small words (i.e. "is", "and", "the"), have difficulty naming common objects, speak in sentences that don't make sense, have difficulty writing and with spelling, have difficulty reading, not able to comprehend other people's conversation, interpret figurative language literally, write sentences that don't make sense, be unable to recite what has been said, or repeat sentences/words, have difficulty pronouncing words, not speak spontaneously, have difficulty answering questions or following directions, use nonsense words and not realize that they don't make sense.

Individuals with this disorder may also have physical difficulties related to the lesion in brain.

Types

Aphasia is broken down into two categories

Non-fluent aphasia: It produce a failure in language expression, written or verbal and are often associated with pathologies in Broca's brain area.

Fluent aphasia: It refers to deficits related to comprehension and is usually associated with Wernicke's area pathologies.

Non fluent aphasia: Can be categorized into three types: Broca's aphasia, transcortical motor aphasia and global aphasia.

Broca's aphasia: Results from damage to the part of brain called Broca's area, which is located in the frontal lobe, usually on the left side. It's one of the parts of brain responsible for speech and motor movement.

Symptoms: Dominated by reduction or suppression of speech output with relative sparing of auditory comprehension. Speech production is effortful, usually limited to word groupings of one to three words produced with labored articulation. Quality of articulation varies as a function of the familiarity of the words in the message. Auditory comprehension at the one-word level is usually close to normal, but impairment in the processing of sentences can usually be demonstrated.

Transcortical motor aphasia: A subtype of fluent aphasia in which repetition is preserved relative to impaired verbal output. Expressive language is effortful and halting, with disrupted prosody, paraphasic errors, and perseveration. Confrontation naming maybe intact. Comprehension is better than production, with impairments primarily on complex language tasks.

Symptoms: The dominant feature in this disorder is the reservation of a near normal span for repetition, along with the severe inhibition of spontaneous speech. Auditory comprehension is relatively unaffected. There is a wide range of variability with respect to word retrieval among transcortical motor aphasics.

Global aphasia: A profound impairment of all modalities of receptive and expressive language. Individuals with global aphasia typically present with marked impairments of comprehension of single words, sentences, and conversations, as well as severely limited spoken output.

Symptoms: difficulty speaking in complete sentences, trouble repeating speech, uttering simple words, making grammatical mistakes, using the incorrect words or phrases, trouble understanding others, difficulty understanding fast speech.

Fluent aphasia can be categorized into four types: Wernicke's aphasia, conduction aphasia, transcortical sensory, anomic aphasia

Wernicke's Aphasia: It is a result of a lesion that includes the entire posterior portion of the first temporal gyrus, known as Wernicke's area.

Symptoms: Auditory comprehension is defective even for the comprehension of common object names. Rate of speech is sometimes excessively rapid and they may be unaware of their many speech output errors. Reading and writing are affected to varying degrees depending on the boundaries of the lesion.

Conduction aphasia: A large proportion of conduction aphasics have a lesion in the supra marginal gyrus, compatible with the anatomical account of Geschwind Lesion extend in conduction aphasia is more restricted than in either Broca's or Wernicke's aphasia.

Symptoms: The general level of articulation, rate of speech, and use of grammatical elements is fluent, but speech output is usually disrupted by characteristic errors. Substituting or inserting extraneous phonemes, and making repeated stabs at correcting themselves. Repetitions of words or sentences modeled by the examiner is remarkably poor.

Transcortical sensory aphasia: Transcortical sensory aphasia is commonly produced by deep-going lesions in a zone inferior to the angular gyrus and between the posterior end of the sylvian fissure and the temporo-occipital junction. Symptoms: auditory comprehension is impaired and patients are generally unaware of their language difficulties. The sparing of repetitions in these severely affected patients is striking not only do they repeat fairly long sentences. Errors generally take the form of semantic word substitutions.

Anomic Aphasia: Anomic aphasia is one that appears as a result of diverse causes and a result of lesion sites that are remote from each other.

Symptoms: Speech output is fluent with respect rate, syntactic form, and articulation. Speech is commonly filled with vague, circumlocutory substitutions for the intended concepts and these substitutions serve as a place holders to maintain grammatical structures.

Management

The clinical issue in current approaches to Aphasia therapy is the necessity to individualize the therapeutic modality for the specific Aphasia type. Traditional methods of aphasia therapy have been improved by careful selection of timing and frequency of treatment delivery. Most of the speech language therapist use stimulation response or direct retraining of deficit, as one aspect of therapy program. The newer technique, called melodic intonation therapy (MIT) is neurobehaviorally based. Aphasia therapy also includes evidence based therapy techniques such as Visual Action Therapy (VAT) and script training.

Melodic Intonation Therapy

Melodic Intonation Therapy (MIT) is a restorative or linguistic technique that utilizes "intoning" to facilitate verbal expression in clients who demonstrate severely restricted verbal output and relatively good speech comprehension. This approach varies in pitch, tempo or rhythm and stress for participation of the right hemisphere to improve verbal production in clients with damage to the language dominant left hemisphere.

MIT program consist of an 8 steps hierarchy which is presented in a contended form as follows

1. Client taps out rhythm while listening to clinician's hummed and intone utterance.
2. Client and clinician intone utterance in unison.
3. Clinician fades out of unison production.
4. Client independently imitates clinician's model of intoned utterances.
5. Client responses no longer intone, but produced in unison with exaggerated inflexions and then gradually shaped to approximate more normal speech prosody.
6. Clinician fades out of unison production.
7. Client independently imitates clinician model of spoken utterances.
8. Client fades initiative response and spontaneously produces the spoken utterances in response to

clinician's questions.

9. MIT generally begins with utterances consistency of two and three syllable words and commonly used phrases longer and more complex utterances are generally introduced at later stages in the program.
10. Each step in the program has specific scoring procedures.
11. At all levels of stimulus difficulty it's recommended that the utterance should be produced slowly and with continuous voicing.
12. The most suitable candidates for MIT are Aphasia individuals who demonstrate the following characteristics. Unilateral stroke in left frontal lobe (Broca's area) often extending to parietal region.
13. Severely limited verbal output with poor speech articulation.
14. Extremely poor imitations skill.

Visual Action Therapy (VAT)

VAT is a substitute of or compensatory approach for aphasia intervention that enhance an individual's functional communication skills through use of representational gesture rather than speech. The non-verbal strategy designed for globally aphasic individual focus on production of message at single gesture level. Ultimately, client progresses from matching pictures to use of symbolic hand or mouth gesture to communicate.

VAT basic training sequences summarized as follows

1. Client matches and then point to object and pictures enforce different seven way discrimination task.
2. Client is taught to demonstrate appropriate use of each object through clinician modelling and shaping until spontaneous performance is achieved.
3. Clinician point to a specific action picture and the client is required to pick up corresponding object from an array of seven and demonstrate its use.
4. Client locate or point to a specific action picture and client from an array of seven in response to determine gestures produced by clinician
5. Client is required to produce appropriate gesture when shown each of seven objects.
6. Client is shown two randomly selected objects, which are then hidden, object is then returned to view and client is encouraged to self-initiative correct gesture.

Script Training

A Treatment technique that uses script knowledge which include understanding, remembering and recalling event sequences in routine activity. Scripts are designed to enable the patient to learn specific phrases related to specific situation. They involve intensive drilling practice using cueing over a number of session, which is often achieved through repeated reading or computer based system. The therapist and patient should develop an individualized script together by considering the person's communication needs, activity of interest and then practice it intensely till the production becomes automatic and effortless.

Case study

Methodology

Aim: The study was conducted to investigate the issues faced by the client before starting speech-language therapy and the improvement the client had after speech language therapy.

Participant selected

A client named Prabhath aged 28 years old male came with a complaint of difficulty in speech due to accident which caused a head injury. Speech and language assessment was done on 4th august 2022. On observation he was having visual disturbance and occurrence of convulsions after 2years of surgery.

As per medical records NECT scan of the brain was done and found that he has multiple hemorrhage contusion in the left fronto-temporal lobe with surrounding Edema and subarachnoid hemorrhage [SAH] in left frontal lobe along with acute subdural hepatoma [SDH] in left front parietal temporal region.

Therefore, through the observation of the client, a standardized test material WAB [Western Aphasia Battery] was administered.

WAB score before therapy

Spontaneous Speech

Information Content	0/10
Fluency Grammatical Competence and Paraphasia	0/10
Total	0/20

Auditory verbal comprehension

A. Yes/No Questions	39/60
B. Auditory word recognition	29/60
C. Sequential commands	35/80
Total	5.1/10

Repetition

Total	0/10
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Naming and word finding

A. Object Naming	0/60
B. Word Fluency	0/20
C. Sentence Completion	0/10
D. Responsive Speech	0/10
Total	0/10

Final Findings (Total Score: 10)

Fluency	0
Auditory Verbal Comprehension	5.1
Repetition	0
Naming	0

Type of Aphasia: Broca's Aphasia

WAB score after therapy

Spontaneous speech

Information Content	1/10
Fluency Grammatical Competence and Paraphasia	2/10
Total	3/20

Auditory verbal comprehension

A. Yes/No Questions	43/60
B. Auditory Word Recognition	38/60
C. Sequential Commands	41/80
Total	6.1/10

Repetition

Total	8/10
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Naming and word finding

A. Object Naming	30/60
B. Word Fluency	8/20
C. Sentence Completion	3/10
D. Responsive Speech	5/10
Total	4.6/10

Final Findings (Total score:10)

Fluency	2
Auditory Verbal Comprehension	6.1
Repetition	8
Naming	4.6

Type of Aphasia: Transcortical Motor Aphasia

Language techniques used

1. MIT.
2. VAT.
3. Script training.

Conclusion

Neuronal sprouting is any process where neurite growth occurs, through the modifications to synapse. The neuron grows to establish connections with other neurons. Neuronal sprouting might be the growth of new branches or extensions from existing neurons in response to injury or disease. This process is a form of neuroplasticity, which allows the brain to rewire itself and adapt to changes in the environment. Neural sprouting is thought to play an important role in recovery from brain injury, where the brain compensates for lost function by forming new connections between neurons.

A single case study on a client with Broca's Aphasia showed that after continuous speech and language therapy the severity of Aphasia reduced. The therapy techniques used are Melodic Intonation Therapy, Visual Action Therapy and Script Training. These changes might be due to the neuronal sprouting in the brain that takes place after brain injury.

There are various factors that affect the prognosis of treatment. The factors that affect the prognosis are age, gender, handedness, language use, educational background of the client, occupation, site of lesion, extent of lesion, etc.

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