

The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study

فعالية الطريقة الايقاعية النغمية في التخفيف من أعراض التحويلات الفونولوجية لدى حبسي

بروكا (دراسة حالة للمتحدث باللهجة الجزائرية)

Soumia GUERROUF ¹, Abdallah BENOSTMANE ²

¹P.H.D. student, University Mohamed Ben Ahmed Oran 2,
guerrouf.soumia@univ-oran2.dz

²Professor. University center Tipaza, benostmaneabdallah@cu-tipaza.dz

Received: 06-07-2024

Accepted: 01-11-2024

Abstract:

Objective: The current study is investigated to determine whether melody intonation therapy which aims to increase the severity of phonological paraphasias Symptoms for patient with broca's Aphasia

Methods: Based on the single-group design, we deliberately chose the patient A.B., an 83-year-old patient who having suffered a stroke on the left side of the brain. We assessed his language abilities in particular with respect to expressive language abnormalities before applying the method (Melody intonation therapy) by 'MTA' test.

Results: The result was a total score ($p = 80\%$) in the pre-evaluation. However, after 15 sessions of applying the technique, we recorded ($p = 50\%$), and at last, in the post evaluation, we obtained ($p = 20\%$), which shows the value of melody intonation treatment in raising PP.

Keywords: Aphasia; Broca's aphasia; Verbal Paraphasia; Paraphasia Phonological, Melody Intonation Therapy.

JEL Classification Codes: MIT: Melody Intonation Therapy, PP: Paraphasia Phonological, MTA: Montréal Toulouse Algeria test.

ملخص: الهدف من الدراسة: تهدف الدراسة الحالية إلى البحث في فعالية العلاج الإيقاعي النغمي في التخفيف من نسبة ظهور اضطرابات التحويلات الفونولوجية لدى حبسي بروكا.

الطريقة وأدوات الدراسة: بناءً على تصميم المجموعة الواحدة، اخترنا قصدا الحالة أ. ب.، وهو مريض يبلغ من العمر 83 عامًا تعرض لسكتة دماغية في النصف الأيسر من الدماغ،

تقييم قدراته اللغوية الشفهية حيث تم تشخيصه باضطراب الحبسة من خلال تطبيق اختبار "MTA".

النتائج: تم تسجيل نسبة التحويلات الفونولوجية في القياس القبلي بنسبة ($p = 80\%$). و بعد 15 جلسة من تطبيق التقنية سجلنا ($p = 50\%$) ، أما في القياس البعدي حصلنا على نسبة ($p = 20\%$) مما يدل على فعالية العلاج الإيقاعي النغمي في التخفيف من نسبة ظهور التحويلات الفونولوجية لدى حبسي بروكا.

كلمات مفتاحية: الحبسة. حبسة بروكا. التحويلات الشفهية. التحويلات الفونولوجية. الطريقة الإيقاعية النغمية.

Corresponding author: BENOSTMANE Abdallah, e-mail: benostmane.abdallah@cutipaza.com.

1. INTRODUCTION

Aphasia is a broad term that refers to all disorders of language communication associated with acquired brain damage leading to a disruption of linguistic coding, these disorders can affect oral or written expression and comprehension to varying degrees, frequently in the left hemisphere, which is typically the dominant hemisphere for language. Depending on the aphasia type and the affected areas, this deficiency affects the lexical, semantic, phonetic, morphological, and pragmatic levels of language (Sophie et al, 2010, p 63). Where Wernicke's Aphasia is a fluent aphasia characterized by difficulty in understanding language as well as difficulty in repetition of language, The speech is fluent but paraphasic.

Paraphasia includes the omission of parts of words, incorrect use of correct words, use of neologisms ("new words"), and substitution of incorrect phonemes for correct ones. Verbal or semantic paraphasia is the

Title : The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study.

incorrect use of words; literal paraphasia is the substitution of incorrect phonemes for correct phonemes (Wanda G, 2017, P211), while the second type is referred to as Broca's aphasia is A brain injury in the deep and superficial areas of the Sylvain fissure is known as non-fluent aphasia, Its symptoms include a quantitative and qualitative deficit in oral expression, a large number of phonemic transfers, word deficit, or facial apraxia, a disturbance in tone, and a small percentage of difficulty understanding. dysfunction in reading and writing (Brin Henry et al, 2016, p20) and one of the most common symptoms that we find in Broca's aphasia imprisonment is phonemic transfers, which recognize that it is a mechanism that works on lexical representation that has been accessed in a way that transforms its syllabic structure in a different way, characterized by errors in the production of the target phoneme. It makes the word ambiguous to the listener, that is, it appears as a random distribution of the phonemes that make up the word (Hugh W, 2007). The reasons for these errors are explained through several studies carried out by researchers. We refer to one of them as follows: Alajouanine et al (1964), it examined voice discrimination errors in aphasia's production and comprehension, and the findings for each of them indicated that the patient often produces phonemes that he does not understand well. In another study of aspects of the vocal behavior of aphasia carried out by Miceli (1980) on a sample of about 14 patients The case was examined in the following situations: naming repetition, syllables that have no meaning, spontaneous speech, reading aloud, the results of which showed that six out of seven patients failed the test of distinguishing the phoneme only, but they are able to produce it, although they do not have difficulties in understanding, That is, there is a defect in the coding or decoding of the audio, and the errors of the coding are interpreted on neurolinguistic grounds due to deficiencies in the audio level itself, or difficulty in audio analysis or its production, which indicates damage to the channels that carry the inputs and outputs of the audio system, and therefore due to these problems that Broca's aphasia suffers.

So Researchers have been interested in developing rehabilitation strategies and improving therapeutic methods in order to provide appropriate intervention. Then Among the most important of these methods a well-known method for the rehabilitation of nonfluent aphasics with severely reduced output is Melodic Intonation Therapy (MIT; Sparks et al., 1974) which exploits the right hemisphere's musical competence. Briefly, in MIT each word or phrase is intoned by the therapist; the patient should initially hum the melody pattern, then sing in unison with the therapist, and finally reach a stage when he or she can intone the phrase alone. At the third and final level the patient should be able to revert to normal speech prosody (Anna, 2003, p80), and consider an intervention method based on facilitating spoken language through the exaggeration of three elements of spoken language prosody: pitch, the tempo and rhythm of utterances, and stress for emphasis Speaking tasks are gradually increased in length and complexity as treatment progresses in a hierarchical fashion, starting with shorter, easier speaking tasks and ending in longer and more grammatically complex utterances. Tempo is slowed down so that the utterance is lyrical in nature. Variation of spoken pitch is reduced and made more constant or monotonic. Stress is exaggerated for emphasis using pitch and volume changes (Brooke, 2007, p523), and that what these studies improve that demonstrated the effectiveness of this method in alleviating the severity of phonetic transfer disorders with patient Broca's aphasia is the study of Sparks and Hollond (1976) on a sample of 8 individuals. Diagnosed with aphasia using the Boston Assessment Test, in which the focus was on restoring linguistic formulation rather than the motor aspects of speech production by directing the ability to encode ideas into units of meaningful verbal communication, the results of which showed that six out of eight patients achieved effectiveness in reducing the frequency of vocal errors. As a result, we move on with further study to examine the effectiveness of the approach Melodic Intonation Therapy with phonological paraphasia based on the theoretical basis provided in these earlier studies. The following inquiry was made in relation to broca's aphasia: After using the MIT approach. Are there statistically significant variations between the pre- and post-measurements of phonological paraphasia with Broca's Aphasia?

1. Information sources/search strategy

Aphasia:

Benson & Ardila (1996) explain aphasia "Aphasia can be defined as the loss or impairment of language caused by brain damage>>.

Broca's area is found in the motor association cortical area at the foot of the primary motor and the premotor cortices. This area was named after the French neurologist, Pierre Paul Broca, who first described the expressive language disorder we now refer to as Broca's aphasia and described an area on the lateral surface of the brain as the area of damage causing the expressive problem. Described by Broca as the posterior inferior frontal gyrus, roughly the third left frontal convolution, this area in general became known as "Broca's area." The location now considered Broca's area includes the pars opercularis (Brodmann's area 44) and the pars triangularis (Brodmann's area 45) in the posterior inferior frontal gyrus.(Wanda G,2017, P 113) Broca's area corresponds to the third frontal gyrus (F3) and is typically defined in terms of the pars opercularis and pars triangularis of the inferior frontal gyrus, represented in Bradman's cytoarchitectonic map as areas BA44 and probably BA 45 too (Figure1)

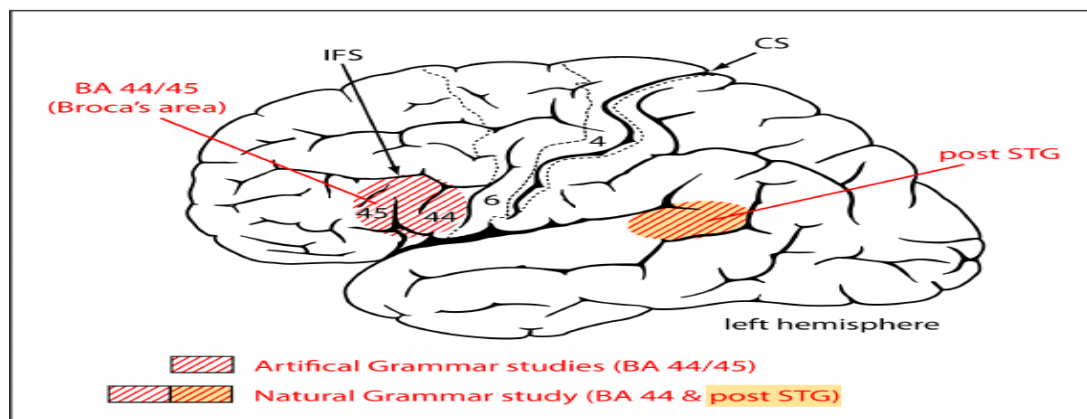


Figure1: Schematic view of activation pattern for the main effect of hierarchy in the language domain. For Artificial Grammar I and II, the main effect of hierarchy was found in Broca's area (BA 44/45) (Angela and others, 2011).

Broca's aphasia

Broca's aphasia is characterized by retained language comprehension, but impaired speech production, resulting from lesions of Broca's area (posterior regions of the left third frontal gyrus: Brodmann's areas 44 and 45). Symptoms range from muteness to slowed deliberate speech using only key words without coordinated grammatical structure, and include difficulty reading aloud and writing. Moreover, these patients often exhibit right hemiparesis and homonymous hemianopsia. (Marc et al, 2009, p469).

Verbal Paraphasia:

Frank and Martha (1969) : "Paraphasia is a well-known aphasic symptom meaning inappropriate substitution of a phoneme or word>> .

Phonetic deviations or paraphasia phonetic:

They correspond to the modification of a word or syntagm by phonetic deformation of one or more of its phonemes. This is a violation of articulation, resulting in articulatory or articulatory disorders. According to the degree of severity, the patient may produce phonemes that no longer belong to the register of the language due to phenomena of deafening, nasalization, occlusions, pseudo-diphthongizations, elisions of complex consonant groups, etc. (Sophie et al, 2010, p 63)

Phonemic or literal paraphasias:

They correspond to the transformation of a target word by phenomena of substitutions, omissions, additions, inversions, displacements of its phonemes constituents. These deformations can be isolated or be associated in the same word. Easily identifiable orally and transcribable in writing by the examiner since these errors respect the rules of the phonological system,

they are not therefore in no way the fact of an arthritic disorder. (Sophie et al, 2010, p 63)

The ASPECTS OF PHONOLOGICAL PARAPHASIA

Antenorio (1997) "Phonology is the study of the sound structure of language. In both speaking and understanding, it provides the medium by which meaning is conveyed" (p157).

Substitution: The first type of phonological error is substitution where the substitution phoneme may not belong from the direct context of the expression and the phoneme unit is extraneous, or it may already exist in the phonemic context, meaning that there is no contextual source in substituting phonemes by its very nature assumes that there is some kind of selection problem between phonemes. Its constituents, which are completely similar in their distinctive composition.

Transposition: There are three types: anticipatory (retrograde), (progressive), and substitution (full substitution). Predicate errors involve right-to-left movement of some syllabic units; the initial consonants of syllables in speech are usually those expected, projections may be substitution or genitive. i.e. the expected /n/ in the word *nondon* for London, where there was no consonant in the initial position of the target word, progressives are also typical of transposition errors, they move from left to right; errors may be substitutional or additional, and may or may not remain in their original position. Exchanges represent the last type of transposition error, and although they occur relatively frequently in slips of the tongue, they rarely occur in aphasia. (Chris, 1989, p 91).

Additions: addition errors consist of adding a segment to the structure of the word. It can be a phoneme foreign to the word: we then speak of pair

creation (b). the addition of phoneme between two segments of the same nature will be analyzed as a vowel epenthesis or (c) or consonantal (d) (Xavier et Marc, ,p360).

Omission: The omission of syllables is also seen in phonemic transfers, the consonant group often being the site of an omission error in a sense a simplification for words (chris, 1989, p 91).

Output Processing :

Phonetic Selection: After brain damage, many patients fail to read aloud or name words correctly, even though they seem to know the correct pronunciation. That is, they appear to access the target phonological representation, but then produce either a phonologically similar word (e.g., mitten → “kitten”; Martin, Dell, Saffran, & Schwartz, 1994) or non-word (e.g., mitten → “titten”). They may attempt to self-correct the phonological error. A case in point is that of JBN (Hillis, Boatman, Hart, & Gordon, 1999). JBN had fluent, grammatical speech, but with frequent phonological errors. Her comprehension of written words was intact, as indicated by printed word/picture verification tasks with both phonologically and semantically related foils and by matching printed words to synonyms. She also seemed to access the correct phonological representation, as indicated by her ability to match rhyming words or pictures. Nevertheless, in oral reading (and oral naming), she made frequent phonological errors in producing the words. The problem was not in motor planning or articulation, since JBN correctly repeated nonsense syllables. Rather, her performance was explained by assuming impaired selection of the sequence of phonemes (or sub-lexical phonological units) to articulate. (Hillis.2015. p17).

Motor Programming and Articulation

Once the sequence of phonemes (or phonetic segments) is selected for output it must be translated into the appropriate sequence of movements through programming and coordination of the lips, tongue, jaw, soft palate, and vocal cords. (Hillis.2015. p17).

Title : The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study.

The melody intonation therapy method:

MIT developed by Albert, Sparks and Helm (1973). This therapy approach is based on a rationale of using music-like speech production intended to recruit processes in the intact right hemisphere. The approach can be broadly classified as 'brain reorganization'. Functional brain-imaging work, however, has found no evidence that it does recruit right-hemisphere language (Anne and others, 2014,p91). Intonation-based in non- or poorly fluent patients with aphasia A hierarchically structured therapy that uses tonal (lyrical) patterns across three levels of increasing difficulty. These different levels (beginner level, intermediate level, advanced level) by increasing the length of the sentence , increasing the production speed, and decreasing the level of support provided by the processor.(Gregory and Steven, 2015, p1025).

2. Principal Methods:

Therapeutic training program:

Program Objective: The general purpose of that program is improving the ability to produce verbal fluent by sing.

Program content: Based on a series of pre-programmed procedures to create melodic phrase correctly, the program contains four levels in accordance with the hierarchy, from the easiest to the most difficult.

level one :

Method: Focusing the patient's attention by delivering a musical reinforce designed to stimulate their auditory system while avoiding overly rewarding appropriate behavior so that the case can self-treat.

Objective: The goal is to stimulate the auditory brain areas' neurons, which are involved in audio discrimination.

Instruction: Hold the patient's hand and instruct him to begin making a tonal sound.

Second Level:

Second Level: Method: Training in percussion with respect to the tone from rhythm one to rhythm five, where the expert percussions on the tones climbing from 1 to 5, then we ask him to hum a melody in time with each rhythm. Thus gradually removed the reinforce until he can compose words without it.

Objective: Developing listening comprehension based on the variety of rhythms while releasing simple verbal output is the goal.

Instruction: you are repeating the rhythms to me when I drum over the tonal.

The third level:

Methods: The third level: METHODS: Selecting words with the greatest number of phonological faults that the examiner observed while doing the oral language evaluation.

He proposed that the patient melodize the syllables with him after breaking it up into static/silent syllables and pronouncing them in the rhythm of melodies.

Objective: To improve his ability to distinguish the different phonemes that makes up words.

Instruction: Divide the word into syllables then sing it.

Fourth level:

Method: Eliminating the reinforce and depending on self-monitoring of verbal output.

Objective: To achieve self-correction while adhering to the phonetic order of the words.

Title : *The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca’s Aphasia of Algerian-speaking: case study.*

Instruction: After giving him a few simple sentences, we have him repeat them aloud while we watch his oral productions.

3. Information sources/search strategy

Study design:

The study's application methods were carried out at a private medical clinic in Algeria, where patient was evaluated and treated using this method over the course of four months, with two sessions per week.

Participant:

The study followed a controlled single blind design represented by case the patient T.A. aged 83 years, was deliberately chosen depending on the nature of the studies, who sent by a neurologist with an MRI report indicating a stroke on the left side of the cerebral hemisphere.

Baseline participant characteristics

Age :	83 years
Female:	Male
Years of Education	no education
Handedness	Right
Language Arabic)	bilingualism (Tamazigh,
Stroke Type	Ischemic
Apraxia Severity Rating Scale	Mild

Attention	80%
Cognitive Flexibility	70%
Verbal Short-term Mem	60%
Working Memory	65%

Fig2: the clinical information of the case.

Study tools:

Assessment and Diagnostic Tools:

Interview:

It is a strategy intended for a dynamic confrontation between the examiner and the case for the purpose of evaluating and diagnostic language disorders as a result of the stroke he suffered, for a more complete picture of the underlying deficits of language, then presenting the therapy plan based on the melody intonation therapy.

Evaluation and Diagnostic Tests:

Auditory Discrimination Skills Test by Dr. Maher Shaaban Abdel-Bari: It contains 14 basic skills of auditory discrimination, which are among the basic skills of the art of listening. On it, or distinguish between the sounds or

Its aim: to evaluate the process of processing and distinguishing sounds in the case, and get more determining auditory impairments in aphasia such as errors phonological

MTA Test by Nasira Zalal:

This test was designed by a French-Canadian team consisting of 12 researchers in 1986. It was adapted and calibrated to the Algerian environment by Professor Nacira Zelal in 2000. Its items are as follows: -

Title : The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study.

Oral language test - Written language test - Oral and written comprehension test - apraxia tests - Agnosia tests (Zellal, 2000)

Items related to oral language and oral language comprehension test were selected:

oral language test	oral language comprehension
• Spontaneous expression. • Auto expression. • Lexical evocation. • Repetition. • Naming • Verbal narration	• Oral comprehension of words and sentences. • Read words and sentences. • Understanding the text. • Read the numbers.

Punctuation:

The previously described grading is done by extracting a percentage ranging from zero percent to 100 percent, which is transferred to the aphasia drawing, which is represented according to a horizontal axis that includes tests and a vertical axis that includes percentages of success.

Result:

Clinical analyses:

Type of PP	Percentage of phonological errors
Substitution:	30%
Additions	20%
Omission	60%
Transposition	50%

Fig3: The table shows the percentage of the type of phonological errors.

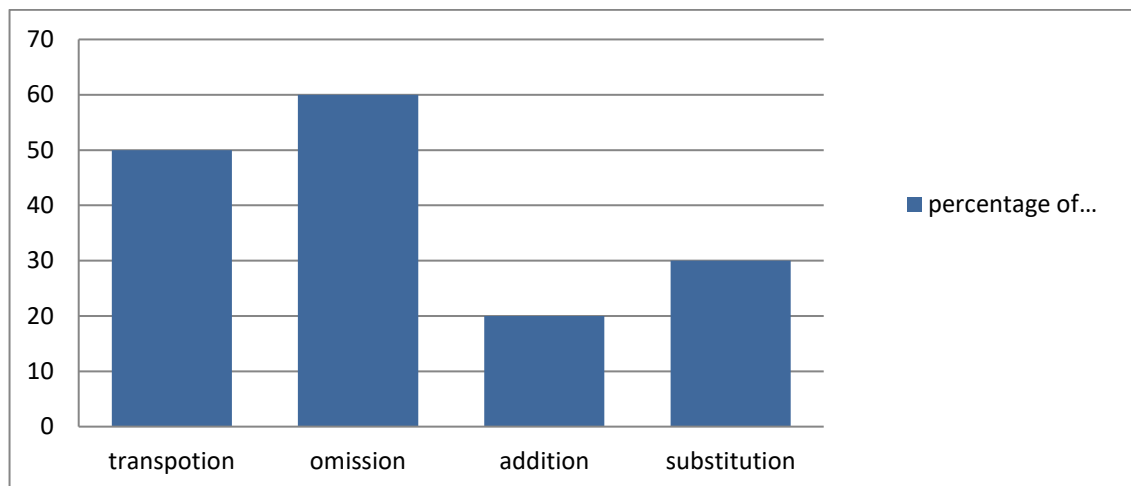


Fig4: the percentage of the type of phonological errors.

Discussion :

These data, feature by the MTA test in the post-stroke assessment, explain that PP can be divided into four types of phonological errors, namely substitution, transposition, addition and omission. The voice analyzes of this case show that the percentage of transposition was 50% and is more common in spontaneous speech by changing the position of sounds in words; the second type is the omission of one or more phonemes belonging to the word where it is located. The percentage was a maximum of PP types, of which 60% were related to naming pictures, while the third type is the addition was present minimum percentage of PP with 20% that rarely occur in the speech. The fourth is substation type accounted for 30% of the total phonological errors in the patient's out speech. On the basis of this results we supposed to the case using the term short to facilitate verbal production because they impaired to access to selection of the sequence of phonemes (or sub-lexical

Type of PP	target	production	The correct term
Substitution:	khefif	/sfif/.	/xfif/.

Title : The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study.

additions	cheta	/mechta/.	/cheta/.
Omission	Tmatime	/ta:tim/. /Ta:h/, /beisra/.	/tema:tam/./tefa:h/, /biskra/.

phonological units) to articulate.

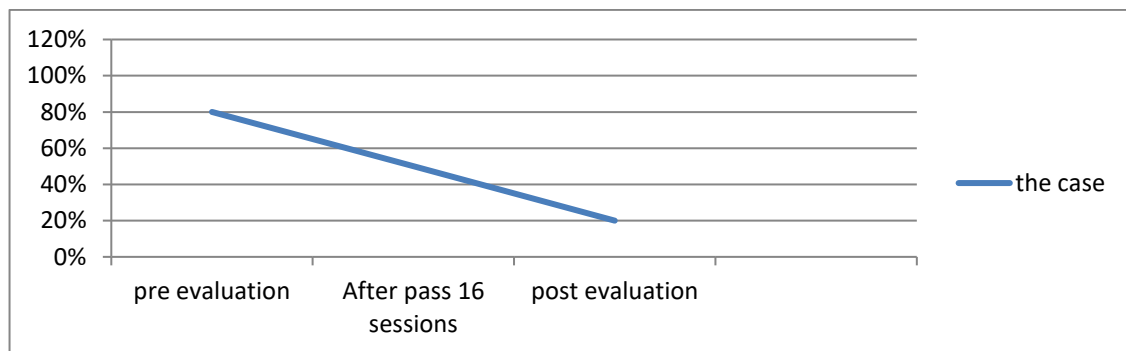
Clinical analyses:

Fig5: example of phonological errors with Algerian language.

In this table, we show the scores for phonogical paraphasia according to the MTA test:

Therapeutic classes	Pre evaluation	After pass16 sessions	Post evaluation
Percentage of phonological paraphasia in the case	20 %	50 %	80 %

Fig6: This table presents the percentage in the pre-evaluation and after passes 16 sessions of the treatment program and Post evaluation



Note: Percentages rounded and may not total 100%.

Fig7: This curve represents the percentages obtained for the paraphasia phonologic produced by the case in pre evaluation then after pass 16 sessions and in post evaluation.

Results synthesis:

Analysis and interpretation of curve:

The curve displays the results of the measurement of the phonological paraphasias alterations caused by the case identified as having Broca's aphasia by MTA test, after and before the therapy program's application. We observe that before applying the MIT, the pre-measurement's percentage of phonological faults reached 80%, which denotes a conspicuous emergence of errors with different types of errors occurred when produce the target word or a particular syllable, such as when the word /xfif/ was substituted with the word/sfif/, the sound /x/ was changed to /s/, or the phoneme /m/ was added to the word /cheta/ to make it /mechta/, and in the some words were delete its phoneme like /tema:tam/ change to /ta:tim/.

indeed this describes all that We discovered, that errors occur more frequently in nouns than in verbs, which suggests that there is a phonological treatment problem more frequently in nouns. We also observe that, in spontaneous production like describing a scene or expressing his thoughts, alterations are more pronounced in naming and repetition tasks. The failure of the case to produce the proper speech is characterized by increased errors for the target word (e.g. less vowel errors), greater errors on consonants, word-final consonant clusters, and word-medial locations.

After implementing the program in 10 therapy sessions, the data showed us an improvement in the percentage, which denotes a decrease in the severity of the disease. Due to exposure to melodic alterations in the first and second stages, where spontaneous speech improved through the case awareness of errors, the percentage of PP was assessed at 50%. This demonstrates that the method affects the rate at which the disorder advances because the case can correct phonetic mistakes and restructure the sounds made while speaking

We observe in the post-measurement that a rate of 20% was noted following the application of the program in 18 treatment sessions,

Title : The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study.

demonstrating the effectiveness of the melodic intonation therapy method in reducing the severity of the phonological paraphasias disorder and achieving the program's objective, which is the patient's capacity for self-correction of his language verbal. The remaining 20%, which shows the condition's inability to control some verbal sounds, may be caused by a variety of factors including the extent of the brain injury, its effects on the linguistic processing areas, and how the condition interprets vocal inputs and outputs.

Conclusion

The findings lead us to the conclusion that the phonological transfers we observe when diagnosing Broca's aphasia are a random organization of phonemes that can improve at good rates through self-correction cases reach after applying the melody intonation therapy method, and therefore can be adopted by the specialists as a selective strategy that helps in improving language disorders for individuals with aphasia due to traumatic brain injury.

5. Bibliography List:

1. Anna Basso. (2003). Aphasia And Its Therapy. Oxford University Press, First Edition.
2. Anne Whitworth, Janet Webster And David Howard. (2014), A Cognitive Neuropsychological Approach To Assessment And Intervention In Aphasia. Psychology Press, New York, Second Edition.
3. Argye E. Hillis. 2015. The Handbook Of Adult Language Disorders Second Edition psychology Press. NEW YORK.
4. Brigitte Stemmer, Harry A. Whitaker. (2008). Handbook Of The Neuroscience Of Language. Academic Press. First Edition
5. Brin Henry Et Autre. (2016). Dictionnaire D'orthophonie. Ortho Edition, France , Troisième Edition.

6. Brooke Hallowell. (2017). Aphasia And Other Acquired Neurogenic Language Disorders. Plural Publishing, San Diego.
7. Chris Code. (1989), The Characteristics Of Aphasia. Crc Press.
8. David Frank Benson, Alfredo Ardila. (1996). Aphasia: A Clinical Perspective. Oxford University Press. United States of America.
9. Gregory Hickok , Steven L Small. (2015). Neurobiology of Language.
10. Elsevier Inc, U.S.A.
11. Marc D. Binder, Nobutaka Hirokawa, Uwe Windhors. (2008). Encyclopedia of neuroscience. Springer-Verlag Berlin Heidelberg
12. Martha Taylor Sarno. (1998). Acquired Aphasia . Academic press.
13. Sophie Chomel-Guillaume, Gilles Leloup Isabelle Bernard. (2010). Les Aphasies _ Evaluation Et Rééducation. Elsevier Masson.
14. Wanda G. Webb. (2017). Neurology For The Speech-Language Pathologist. Elsevier Inc, United States Of America. Sixth Edition.
15. Xavier Seron et Marc Jeannerod. (1999). Neuropsychologie humaine. 2 édition. Pierre Mardaga éditeur, Belgique
16. Zellal, Nacira. (2000). Test MTA Livret D'élaboration. Université d'Alger.

The articles:

1. Angela Dorkas Friederici , Jörg Bahlmann , Roland Friedrich , Michiru Makuuchi (2011), The Neural Basis of Recursion and Complex Syntactic Hierarchy, Article in *Biolinguistics* , 62, [DOI: 10.5964/bioling.8833](https://doi.org/10.5964/bioling.8833)

Title : The effects of Melodic Intonation Therapy method to reduce Symptoms of phonological paraphasia on Broca's Aphasia of Algerian-speaking: case study.

2. D. Frank Benson, MD, and Martha B. Denckla, MD. (1969). Verbal Paraphasia as. Arch Neurol. 1969;21(1):96-102. doi:10.1001/archneur.1969.00480130110011
3. Hugh W. Buckingham (1987) Phonemic paraphasias and psycholinguistic production models for neologistic jargon, Aphasiology, 1:5, 381-400, [https://doi.org/10.1016/0093-934X\(80\)90117-0](https://doi.org/10.1016/0093-934X(80)90117-0)
4. MICELI, G. (1980). Some aspects of phonological impairment in aphasia. Brain and Language. 11(1), 159–169. [https://doi.org/10.1016/0093-934X\(80\)90117-0](https://doi.org/10.1016/0093-934X(80)90117-0).
5. Sparks, R. W., & Holland, A. L. (1976). Method: Melodic Intonation Therapy for Aphasia. Journal of Speech and Hearing Disorders, 41(3), 287. <https://doi.org/10.1044/jshd.4103.287>.
6. Sparks, R. W., & Holland, A. L. (1976). Method: Melodic Intonation Therapy for Aphasia. Journal of Speech and Hearing Disorders, 41(3), 287. <https://doi.org/10.1044/jshd.4103.287>.