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A Data Synthesis of Melodic Intonation Therapy

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Abstract

The Baby Boomers, one of the largest (modern) generations, made of 76 million people, is entering the prime age to suffer a stroke, which often leads to aphasia. Melodic Intonation Therapy (MIT)is a current rehabilitation strategy for aphasia. Determining whether MIT is an effective and efficient treatment is vital because millions are at risk to suffer a stroke and effective rehabilitation strategies must be established. This honors thesis was a systematic review of previous studies written on melodic intonation therapy. The articles reviewed were chosen based on criteria including age of the patient, type of stroke, and immediacy of therapy. Common themes emerged from the data synthesis including the interest in rhythm as a secondary component of treatment, tapping with the left hand not being necessary, and finally, more research needs to be done. These themes may assist researchers in the focus of future work.

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Chapter I

Introduction

Statement of the Problem

Cerebrovascular accidents (CVA's) (another word for strokes) may be life altering. Parts of the brain may die due to deprivation of oxygen for an amount of time. Depending on what part of the brain dies, basic biological functions may be affected, including expressive and receptive language and speech production. "Stroke is the leading cause of serious, long-term disability in the United States" (The Internet Stroke Center, 2017). The article further states around 800,000 people suffer from a CVA each year and three-fourths of stroke victims are over the age of sixty-five (2017). Meanwhile, there are over 74.9 million Baby Boomers (ages 51-65) and 28 million Silent Generation people (ages 66-80) ("US Generation" 2015). Although a stroke can occur at any age, The Silent Generation and Baby Boomers are at the highest risk.

Considering the millions of people who are at risk to suffer a stroke, speech-language pathologists and other therapists must find an effective rehabilitation strategy to deal with language functions affected by a stroke. Aphasia is the inability to communicate, which includes reading, writing, speaking, and understanding others. Many times, the victim will use only a noun and action verb to get their thoughts across (American Stroke Association, 2016). Their injury may inhibit motor and/or cognitive abilities. A stroke would be devastating—one day talking fluently and with animation to the next day, where not even your loved ones can understand you. Stroke survivors' communication challenges often include cognition not aligning with their desire to communicate or never being able to give enough information to the listener. These

survivors cannot have a coherent conversation. Effective therapy options are necessary in order to help these victims in rehabilitation of their speech, prosody, and ability to recall words.

Multiple authors have studied melodic intonation therapy and different variations of the rehabilitation strategy. Melodic intonation therapy, at its core, is the use of talking in rhythm while taping a finger to keep speech in tempo to help with prosody and fluency of speech (Zumbansen 2014b). The most common alternative to classic MIT includes the addition of rhythm as important, and the removal of kinesthetic feedback. Common to many of the studies was a call for further research based on inconsistent or inconclusive results based on the effectiveness of MIT. Meanwhile, each study had different instrumentation and ways of rating "progress", different outcome wants and sampling. Without a basic definition of what melodic intonation therapy is and what it aims to succeed, each outcome will be evaluated differently. If success is calculated differently, sometimes melodic intonation therapy will be viewed as a triumph while in other cases a failure, even if the same criteria was met.

This purpose of this data synthesis was to review literature written on melodic intonation therapy. With this review of the literature, gaps in articles and inconsistencies were found. However, trends in what has worked have also been uncovered. With this information, an original and efficient take on melodic intonation therapy may be developed. Inconsistencies of experiments may lead to misconstrued data. Research on melodic intonation therapy has been going on since 1974. With one of the largest generations in history getting older, the incidence of cerebrovascular accidents will only rise. There is a call to action to decide if melodic intonation therapy is an effective and

efficient way to rehabilitate Broca's or Wernicke's aphasia patients. This systematic review of literature aimed to create an understanding of what Melodic Intonation Therapy is, how it is being done now, and what more can be done in the future.

Chapter II

Literature Review

Aphasia

Population. In a study conducted by Feigin, Lawes, Bennett, and Anderson (2003), they found a gradual increase in stroke incidence in each decade of life. After age 55, the incidence rate was recorded 4.2-6.5 out of 1000 people. Strokes are the number one cause of long-term disabilities, including speech production and processing. Around 800,000 people suffer and survive strokes each year. Out of the 800,000 survivors, three-fourths of them are over the age of 65 (The Internet Stroke Center, 2017). The Baby Boomers and Silent Generation are entering this age range, and these generations are made of millions of people ("US Generation" 2015).

Etiologies of aphasia. Aphasia was first diagnosed in 1861 when Paul Broca examined a man with impaired speech. He had an infection which impacted his right leg, but also affected the brain (Code, 1989). Broca discovered there was a lesion in the left frontal lobe. The man could only utter the word "tan", but his comprehension was intact. Code goes on to the story of Wernicke who found lesions in the posterior, superior temporal lobe led to difficulties with comprehension of language. These discoveries show aphasia primarily comes from lesions in the left side of the frontal and temporal lobes (Code, 1989). There are many causes for these lesions. The two well-known etiologies of aphasia are strokes (cerebrovascular accidents [CVA's]) or traumatic brain injury. Code states mental diseases such as schizophrenia and dementia may cause aphasia, depending what part of the brain is affected (1989).

Characteristics of aphasia. Code, in *The Characteristics of Aphasia*, stated there are many lenses to look through at aphasia and its characteristics (1989). The first view is through the domains of language: phonology, morphology, syntax, and semantics. With aphasia, language impairment is primary, rather than secondary as in most other diseases affecting language. Code proceeded, stating some problems which appear as an effect of aphasia are actually adaptations of the brain and patient to compensate for what has been lost. Apraxia of speech is a secondary effect of aphasia. Apraxia is the lack of motor skills to produce words. The author shows Brown's theory, which concludes language is set back to primitive behavior like uncontrollable crying or laughing. "For Brown symptoms are errors but they are not deficits… They reflect normal processing… achievements of the patient's cognitive processing" (Code, 1989, p. 8). Telegraphic speech, meaning a lack of fluency, is a prevalent characteristic of aphasia. Another characteristic of aphasia may be fluent speech errored by phoneme substitution. Survivors will have poor repetition but good comprehension. Anomia is a major side effect of aphasia. Anomia is the inability to recall words, especially subjects and verbs, making speech sound empty (Code, 1989).

Treatment

Code expressed that aphasia has properties studied by different disciplines. At the beginning of interest, neurology "had a monopoly on the topic" (1989, p. 1). However, professionals have found aphasia affects many different parts of the brain and the body, including psychological well-being, speech, and other physical tasks. Treatment of aphasia now includes neuropsychologists and speech-language pathologists (Code, 1989). Depending on the cause of aphasia, physical and/or occupational therapists as well as

psychologists may be a part of the rehabilitation team. Treatment could be multidisciplinary, meaning each profession worked on their own tasks with no communication between professions. However, treatment could be transdisciplinary in which professions had on-going open communication with each other and would incorporate aspects of each treatment within their own

Melodic Intonation Therapy (MIT)

Basic description of melodic intonation therapy. The basic purpose of Melodic Intonation Therapy is to activate the right side of the brain during speech, as to retrain the brain to move language and speech abilities to a different part (Zumbansen, 2013b). Melodic intonation therapy is a hierarchical program with three linguistic levels. "The first two consist of multisyllabic words and short phrases and the third of more phonologically complex phrases. The clinician will have the client slowly speak in high-note, low-note sequences which mirror everyday speech" (Zumbansen, 592).

Variances of MIT. Spark, Helm ad Albert (1974) tasked the patient to tap out a normal speech rhythm. When this stage was deemed successful, they discontinued the tapping and moved on to the next stage of therapy. There is little information on what the authors were focusing on for improvement. Aitken Dunham was testing a mix of traditional speech therapy and melodic intonation therapy to see if the combination was effective rehabilitation for aphasiac patients (2010). Stahl variated MIT to also cover rhythm, not just melody (melody is musical notes while rhythm is delivery). First, Stahl et al. wanted to work on prosody of speech. Then he would test later to look at long-term effects of MIT mixed with rhythm therapy. There was no explicit statement of what Stahl and his colleagues were aiming to accomplish (2011). Cohen and Ford's purpose of the

study was to decide if verbally-assisted, rhythmically-assisted, or melodically-assisted therapy had different outcomes in aphasiac patients (1995). There is a theme of the authors working with rhythm along with melody. This shows there is a great interest in rhythm and should be considered heavily in further MIT studies.

Aims of MIT. Aitken Dunham (2010) worked on a multiple baseline experiment, meaning multiple aspects at one time. She decided what to work on based off the two standardized tests she would use: "fluency, conversation and expository speech, auditory comprehension, articulation, recitation and music, repetition, naming and paraphasia" (2010, p. 22). Tjaden stated he would use MIT to improve rhythmicity and naturalness. Naturalness may include loudness, pitch and prosody (2000). The purpose of Hough's research was to increase verbal output of men with Broca's aphasia (2010). Heijenbrok et al. worked to improve trained items and the ability to generalize and extend what the patient learned on prosody of trained items (2016). Conklyn et al. wanted to examine the immediate effects of a modified melodic intonation therapy on responsiveness and repetition (2012). Although not explicitly stated, every author aimed to have more effective verbal output. There are differences in what the authors felt was effective: some though only prosody would do. Others felt rhythm and articulation needed to worked on. These aims of MIT are inconsistent in how they define outcomes. If effective can be objectively defined, MIT can be more successful.

Measurements of success of MIT. With differences in wanted outcomes of MIT also came differences in measuring those outcomes. To determine if there was improvement of the experimental group compared to the control group, Heijenbrok et al. used standardized testing to evaluate ability to repeat, name objects, and auditory

comprehension according to the *Amsterdam-Nijmegen Everyday Language* Test and *Sabadel Story Retell Task* (2016). Tjaden used *The Minnesota Test for Differential Diagnosis of Aphasia* to measure progress of expressive and receptive language. The test includes auditory perception, visuals, reading, speech, and writing. The test has objective ways to score each criterion, allowing for substantial claims, if progress was shown (2000). Aitken Dunham used the *Boston Diagnostic Aphasia Examination* (BDAE-3) and the *American Speech-Language-Hearing Association Functional Assessment of Communication Skills* (ASHA FACS) for Adults to evaluate progress. The BDAE-3 assessed language function by spontaneous speech, audition, expression, reading, and writing (2010). Conklyn et al. also used standardized instrumentation in evaluating success. They used two tests designed from the Western Aphasia Battery. Pre- and post-tests were administered, designed with consultation from three neurologists, two SLPs and two music therapists (2012). Zumbansen et al. used two-hundred-and-forty multisyllabic words that were common to everyday life. The authors recorded the sentences in intoned, rhythmically spoken, and normally spoken instances. Motor outcomes along with mood were measured by a standardized test, interpreted by someone other than the therapists (2014a). Zipse et al. used picture description tasks and conversation to evaluate progress. Both events were transcribed. The picture description was evaluated on time and efficiency found by a formula that evaluated "correct information units (CIU's) per minute" (240). Meanwhile, the conversation was rated on connected speech and pragmatics including how well they held the conversation. These were measured by syllables per phrase and CIU's. The authors also evaluated brain stimulation during therapy which was found through magnetic resonance imaging (2012).

Cohen and Ford analyzed the samples by content, error types and number of intelligible words per minute (1995, p. 55). Stahl, Kotz, Henseler, Turner and Geyer approached data analysis and instrumentation differently. Two speech and language pathologist (SLP) graduate students and the experimenter, after recording the patients, acoustically analyzed articulatory quality and pitch accuracy. Sparks et al. drew lines to show where intonation and stress occurred and compared them to how the sentence would look on paper using musical notes (1974, p. 308). Hough considered a patient "correct" if what they said was intelligible and connected (2010). With different measurements for different outcomes, a patient will never be up to standards for each hospital or clinic they visit and the patient may become overwhelmed and frustrated. The possible negative feelings of patients need to be addressed in future research of MIT and standardization of measurements.

Research efficacy of MIT. Research efficacy was determined by numbers presented by authors, usually found as statistical analyses. Zipse et al. concluded there was a stable growth in ability to produce trained and untrained utterances. The ability to produce fluent speech, especially in trained items, showed growth and stability. No p-values were given (2012). Conklyn et al. showed significant improvement on responsiveness and repetition, with a p-value <.1 and a mean increase of tests scores of 8.1. This shows significant growth of patients treated with modified melodic intonation therapy. Stahl et al. found no significant effect of melodic intoning compared to spoken conditions, determined by an ANOVA. Zumbansen, Peretz, and Hérbert found in their systematic review, only five of fourteen publications analyzed met therapeutic goals (2014). Hough, in 2010, found strong significance of automatic and self-generated phrases, concluding MIT is effective, but more research needs to be done. Heijenbrok et

al. found significant changes in trained and untrained items, but they did not specify what they were evaluating off. Overall, the conclusion can be there are significant findings in rehabilitation, but more studies need to be conducted to solidify data.

Needs Statement

Why a systematic review is needed? Language is what sets apart humans from all other animals. Our agreed-upon, rule-based, system of codes allows for effective and meaningful communication. When someone is stripped of this ability, they lose part of their humanity. Millions of people are entering age 65+, the prime age for strokes to occur. Speech and language rehabilitation strategies must be analyzed for effectiveness because it is crucial for language to be intact for humans. Therefore, a systematic review of melodic intonation therapy literature is needed—to decide if MIT has been proven effective. This includes seeing what limitations there are in current literature but also what has been shown to work. When communication and language has been compromised, an efficient and effective form of rehabilitation must be established and used.

Chapter III

Methodology and Procedures

Search Strategies

A systematic review was conducted for this thesis to examine the effectiveness of MIT as a rehabilitation therapy for aphasia. According to Clarke, a systematic review aims to summarize all available research on a given topic to allow answers to a clinical question. Systematic reviews are considered secondary research and are helpful in putting information in one place (2011). The terms used for obtaining article were (melodic intonation therapy) AND (Broca's aphasia OR Wernicke's aphasia) AND (stroke OR traumatic brain injury) AND (adult).

Inclusion Criteria and Data Extraction

There were few limiting criteria besides the terms presented above, due to the limited amount of research conducted to date on Melodic Intonation Therapy.. There were no date of publishing restrictions because the first article on MIT was in 1974, by Sparks, Helm and Albert. This is the cornerstone for all other research on MIT and was essential for the systematic review. However, articles included were limited with the following criteria: patients must have received melodic intonation therapy within two years of the traumatic brain injury or stroke; have suffered Broca's or Wernicke's aphasia, but not global aphasia; therapy was administered in the patients' native language; a time of publication of 30 years (due to limited amount of material). Multiple databases were used in finding articles, including PubMed, Linguistics and Language Behavior Abstracts, and Health and Medical Collection, which is under ProQuest.

Finally, all articles were coded by the author. Then, a second, non-biased professor coded 10% of the sources picked at random.

Analysis

Sources were analyzed with the intentions of finding discrepancies, similarities and themes of the literature. This was not a meta-analysis which would have included a statistical analysis of the studies' results. Appendix A shows how articles were broken down including citation information, type of study, type of MIT, participant recruitment, age range of participants, etiology, outcome measurements and more. Appendix B shows what the coding table looked like, both for primary coding and coding by another to ensure reliability in coding. Both coders followed the descriptions and definitions found in Appendix B. The second coder recoded 10% of articles collected. When article coding matched, or a discussion was held about differences, and common ground was met, reliability was ensured. Data collected using the coding table were analyzed in Chapter IV, and applied in Chapter V.

Chapter IV

Results

Through searching three databases, hundreds of articles were found. They were immediately excluded if content words were not present, or if the articles were irrelevant even if search words were within the title. This left 37 articles, which included a mix of experimental methods, case studies, and data syntheses. Each article was coded by the author, with 10% being re-coded to ensure reliability in the reading and interpretation of the articles, and to avoid as much author bias as possible. If the coders were not agreement, the original coder went back to review the article. Either this led to agreement, or the two coders talked about the outcomes and came to an agreement.

Study Characteristics

Between all articles, there was a total of 49 participants not including articles in data syntheses. There was an average of 4.4 participants per study. Meanwhile, the average age of participants was 45.5 years old. There was a large range of ages between the articles, from 5.5 years old to 80+. When etiology was disclosed, most often it was intracerebral or extracerebral hemorrhagic stroke or ischemic stroke. However, majority of authors did not state etiologies of their participants. The average time between the stroke or traumatic brain injury, and the start of some form of Melodic Intonation Therapy was 3 years. The implications of these averages will be discussed in Chapter V under limitations.

Data Analysis

Outcomes were varied throughout each article. This is partially because each researcher was looking for different outcomes to measure. Some measured fluency after

MIT, or vocabulary recall abilities. Others looked at spontaneous speech and facial expressions. More outcomes can be read under "Measurements of success of MIT" in Chapter II. Aitken Dunham (2010) found both traditional speech therapy and traditional speech-language therapy with an added music component were both promising when looking at vocabulary, recall, conversation, and generalization. Cohen (1995) discovered melodic, rhythmic and verbal conditions showed no significant differences for producing previously known song lyrics. However, melody and rhythm inhibited intelligible speech. Meanwhile, Fryberg (2013) was simply studying discrepancies between subjective ratings of family members compared to standardized tests. This was done because functionality in the real world is important, and people who communicate with the patient need to understand them. They found family could be more harsh or easier than the standardized test, depending on the task. LaGasse, in 2013 analyzed the effect of external rhythm on motor control and found training had little effect. This whole procedure was done to establish feasibility of using external rhythm keeping for people with motor control issues. Stahl results concluded melodic intoning was not as beneficial compared to normal talking for patients with non-fluent aphasia (2011). Heijenbrok et al. studied immediate MIT intervention compared to waiting six weeks within Dutch rehabilitation centers. These authors found repetition tasks on trained and untrained items improved; however, these results were not maintained after therapy had ended. Factors contributing to the significance ("determinants") included treatment intensity (2016). Hough (2010) recorded results after implementing therapy without tapping on the left hand. This finding may imply kinesthetic feedback is more a distraction and hindrance than help. The author found the participant achieved the 75% criteria for automatic phrases and maintained

their ability after therapy (2016). This participant had received MIT in the past as well, but it did not work for him, so Hough decided to take away the kinesthetic stimulation.

LaGasse (2012) results concluded traditional speech therapy worked better than MIT for their young participants (5.5 years old). This may imply children do not need to retrain the right side of the brain to handle language. Mauszycki worked on production of wh- questions. With application of Melodic Intonation Therapy, participant 1 went from 0% production of wh- questions to 88-100% correct usage, excluding "who". Generalization spread to untrained wh- questions. Morrow-Odom (2013) discovered Melodic Intonation Therapy generated improvement for many different factors, including: phrase length, articulation, use of phonemes and morphemes. This is important because there is a trend with MIT and its effects of articulation and fluency. Zumbansen et al. studied the combination of rhythm and pitch in rehabilitation for people with Broca's aphasia. One result was solely melodic therapy impacted generalization of improved connected speech, while traditional speech therapy and rhythmic therapy did not. A similar trend was seen for production of trained and non-trained phrases. However, there needs to be more studies to determine if improvement of connected speech influences production of sentences with normal intonation. Finally, the authors found melodic therapy had direct effects while rhythmic therapy and indirect but helpful effects (2014a). Summarizing Zumbasen's et al. research, rhythm is a very important component that needs to be researched more and may provide the most observable effects when combined with melodic therapy. All results of each article reviewed are relevant because they all point in similar directions, no matter how different the measurement of success was. Each article stated more research needed to be conducted. However, each individual

result is also important because they provide the clinician population with models of MIT that have been implemented, specify what did not work, and what should be explored more. Application and needs for Melodic Intonation Therapy are presented in Chapter V.

Chapter V

Discussion

Key Findings

Key findings in the reviewed articles hold promise; however, all authors stress how important further experimentation is to solidify the efficacy of Melodic Intonation Therapy. One key finding and important component of the articles is the lack of diversity considering age and race. This could not be controlled, but it limits the ability for generalization of the effects of MIT. Sometimes separate control groups were used while other times the patient stood as both.

A second key finding which needs to be studied more is the effect of MIT on articulation and fluency. A characteristic of aphasia may be interrupted and nonfluent speech, therefore it is important to look at how MIT affects this type of speech, for better or worse.

A third key finding was by LaGasse (2012) when the author found traditional speech-language therapy was more effective for young children than Melodic Intonation Therapy. Along the vein of certain participant criteria, Hough found discontinuing tapping for a man who had already received and saw no benefit from MIT was the key to success (2010). With this, it may be concluded each patient may need a different form of MIT, or no Melodic Intonation Therapy at all. Speech-language pathologists must understand their patient and how they learn.

Another key finding is that most instrumentation relied on the clinician's judgement. There were standardized tests to grade by, but most authors graded the language sample on a recording. This may lead to human error in listening and skew test

results. An amendment to this current practice would be interrater and intrarater reliability reporting. Then there could be statistics shown to prove the least bias and best validity and reliability.

The overlying theme of all the literature reviewed was clear that more research must be done on melodic intonation therapy. Original melodic intonation therapy structure has been tested, and variations of MIT have been implemented. There have been many trials, but so far nothing has been solidified. The idea of melodic intonation therapy is relatively new, so there remains an incomplete picture in the speech and language field. Step-by-step ideas, instrumentation, therapy objectives and wanted outcomes of the therapy will become more concrete and consistent with the progression of studies and experiments. When assessment plans and instrumentation become uniform, MIT can be evaluated and solidified.

Key Factors for Success

Key factors for success point to what needs to be solidified for Melodic Intonation Therapy to be deemed a successful option for treatment of aphasia. First, there needs to be consistency in measurements of success, and what success can be defined as within Melodic Intonation Therapy. If there is no consistency of the measurement of success, a patient may be deemed healthy by one clinician and below average by another. Also, if different clinicians want different things, the patient will never be satisfactory. Patients with aphasia may already have negative feelings and emotions, and feeling less than satisfactory may bring the patient down even more. The creation of consistency within Melodic Intonation Therapy is imperative so the patient knows what is expected of them and can work towards a goal accepted by everyone.

Another key factor for success that is already being seen is the development of models for MIT. No patient is the same and the way they learn may be different, so it is imperative to have different options of treatment so a clinician and client can learn together what works best.

Limitations

The main limitations of Melodic Intonation Therapy is the sample size and great age range of participants. First, the small sample sizes limit the ability to generalize the effects of MIT to a greater population. The wide age range was positive in providing some diversity to the samples; however, there also needs to be the ability to have solidified information for each specific age group. Although diversity of age is important, however, the ages used in each study, and the average age found from all studies, does not allow information to be confidently applied across age groups.

Suggestions for Future Research

Future research should begin with expanding sample sizes. It is understandable why the sample sizes were small-- different types of strokes lead to different types of problems, and right hemisphere strokes are as common as left. Also, there needs to be more development of the original MIT before variations of the therapy can be solidified. Once MIT's efficacy is demonstrated and can be replicated for majority of the population, variations can be developed to treat more individuals with different ways of learning. Research on the addition of rhythm within MIT needs to be studied more. Overall, there needs to be much more research done before Melodic Intonation Therapy can become a reliable rehabilitation strategy for people with Broca's or Wernicke's aphasia.

Conclusion

The results from the systematic review show Melodic Intonation Therapy needs to be researched further before it can be confidently used in a clinical setting with individuals who have suffered Broca's or Wernicke's aphasia as an effect from a stroke. Rhythm is of emerging importance in MIT and should be further studied, as well as the therapy in general. While there is minimal consistency in desired outcomes and measurements of success within MIT practitioners, the flexibility of the therapy is imperative since every person learning styles also vary between individuals. To further the research of MIT, greater sample sizes with limited age ranges need to be studied so generalizations may be possible.

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Appendix A

Part A: Study Identification

Section 1: Citation Information

1. Author(s)	List all authors of study
2. Year	State the year of publication
3. Article Title	Name of article being reviewed
4. Journal Title	Name of journal article was published in
5. Volume, Issue	State volume and issue of article
6. Pages (if possible)	If found, state what pages the article spanned
7. DOI	State the digital object identifier
8. Type of Article	State if peer reviewed, letter to the editor, etc.
9. Coder	State who coded the study

Section 2: Type of Study

Applied Research	A mixed method (quantitative and qualitative) consisting of research used to find a solution to a problem, like finding a cure for an illness or making new technology.
Case Study	A mixed method in which development is studied. The development of a person, place or situation can be studied.
Experimental	A systematic and scientific approach to research in which the researcher manipulates one or more variables and controls and measures any change in other variables.
Quasi-Experimental	Like experimental, but an aspect is actively influences something to observe the consequences.
Narrative Inquiry	Research designed to describe the life of an individual and their experiences.
Survey Studies	Used to obtain a rating of a certain question i.e. How satisfied are you? How effective do you believe treatment was?

*Sections 3 and 4 under Part A, and all of Part B are irrelevant if the type of study is narrative inquiry, survey study, or data syntheses

Section 3: Traditional Melodic Intonation Therapy or Manipulated MIT

Decide if the study used traditional melodic intonation therapy or a variation the therapy.

Traditional MIT	A hierarchical program made of three linguistic levels: multisyllabic words,

	shorts phrases, and phonologically complex sequences.
Variation of MIT	Variations may include excluding tapping, mixing different therapies with MIT, implementing rhythm or prosody.

Section 4: Participant Recruitment (*Age range will be omitted if article is not group intervention)

Age Range	Age range of patients recruited for the study.
Type of aphasia seen in recruited patients.	
Additional Disabilities	Dysarthria, apraxia and dysphagia are commonly seen secondary effects of the CVA. Were any additional disabilities seen in recruited patients?
Exclusion Criteria	What made the researchers exclude possible participants?

Section 5: Inclusion Criteria

PART B: GROUP PARTICIPANT IDENTIFICATION (*Section 1 and 5 will be omitted if article is not based on group intervention)

Section 1: Mean Age
Find and report mean age of participants when they started MIT.

Mean Age of Participants	

Section 2: Place of Therapy
Check where participants were treated.

Country of Therapy	

Section 3: Language of Therapy

Language	

Section 4: Etiology of Brain Cell Death

Thrombus Ischemic Stroke	Cell death in the brain caused by blocking of blood flow at the site of the thrombus

	(collection of blood material). This occurs locally—at the site of the thrombus.
Embolus Ischemic Stroke	Cell death in the brain caused by blocking of blood flow. However, the blockage (the embolus) travels through the blood stream, eventually clogging blood flow to the brain.
Intracerebral Hemorrhagic Stroke	Cell death in the brain caused by a bursting of an artery within the brain tissue.
Extracerebral Hemorrhagic Stroke	Cell death in the brain caused by pressure made by a bursting artery outside the brain, within the meninges.
Closed Head Traumatic Brain Injury	A blow to the head resulting in the brain hitting the skull.
Open Head Traumatic Brain Injury	Injury due to the skull and brain tissue being penetrated by something like a bullet or shrapnel.

Section 5: Mean Age of when the CVA Occurred

CVA Age	

Section 6: Length of Time between Stroke and Therapy.
How much time passed between the patient suffering a CVA and when they were enrolled for therapy?

PART C: MEASUREMENTS OF SUCCESS
Concisely state how authors measured success i.e. generalization, naming tasks, vocabulary, etc.

PART D: RESULTS
What did authors find?

Appendix B

Part A: Study Identification

Section 1: Citation Information

1. Author(s)	
2. Year	
3. Article Title	
4. Journal Title	
5. Volume, Issue	
6. Pages (if possible)	
7. DOI	
8. Type of Article	
9. Coder	

Section 2: Type of Study

Applied Research	
Case Study	
Experimental	
Quasi-Experimental	
Narrative Inquiry	
Survey Studies	
Data Synthesis	

*Sections 3 and 4 under Part A, and all of Part B are irrelevant if the type of study is narrative inquiry, survey study, or data syntheses

Section 3: Traditional Melodic Intonation Therapy or Manipulated MIT
Decide if the study used traditional melodic intonation therapy or a variation the therapy.

Traditional MIT	
Variation of MIT	

Section 4: Participant Recruitment (*Age range will be omitted if article is not group intervention)

Age Range	
Type of aphasia seen in recruited patients.	
Additional Disabilities	
Exclusion Criteria	

Section 5: Inclusion Criteria

PART B: GROUP PARTICIPANT IDENTIFICATION (*Section 1 and 5 will be omitted if article is not based on group intervention)

Section 1: Mean Age

Find and report mean age of participants when they started MIT.

Mean Age of Participants	

Section 2: Place of Therapy
Check where participants were treated.

United States of America

Section 3: Language of Therapy

English

Section 4: Etiology of Brain Cell Death

Thrombus Ischemic Stroke	
Embolus Ischemic Stroke	
Intracerebral Hemorrhagic Stroke	
Extracerebral Hemorrhagic Stroke	
Closed Head Traumatic Brain Injury	
Open Head Traumatic Brain Injury	

Section 5: Mean Age of when the CVA Occurred

CVA Age	

Section 6: Length of Time between Stroke and Therapy.
How much time passed between the patient suffering a CVA and when they were enrolled for therapy?

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What did authors find?