Full-Length Article

Modified Melodic Intonation Therapy for Acquired Non-Fluent Aphasia

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Abstract

For decades Melodic Intonation Therapy (MIT) has shown good potential within the aphasia population, yet has seldom been used as a frontline treatment, rather placed within a myriad of treatment techniques utilized during aphasia therapy. Debate continues regarding the mechanisms of change from MIT, both therapeutically and neurologically. Modified Melodic Intonation Therapy (MMIT) has developed through the work of Music Therapists, lessening the steps utilized in MIT to emphasize a more direct transfer to speech. As the main focus of treatment for non-fluent aphasia, MMIT can be an effective means of language re-acquisition. This clinical report will discuss outcomes from seven clients with chronic non-fluent aphasia who received treatment from a home-based Music Therapy service.

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Introduction

It is believed that approximately 1 million people are currently living in the United States with aphasia [1]. Aphasia is defined by the American Speech and Hearing Association as "an acquired neurogenic language disorder resulting from an injury to the brain—most typically, the left hemisphere"[2]. Non-fluent aphasia occurs when the inferior frontal gyrus, which includes Broca's area (historically referred to as Brodmann 44 & 45, and more recently as areas 44 & 45 within the inferior frontal cortex [3]) is directly, or indirectly, affected. Those with non-fluent aphasia often present with mostly preserved comprehension yet demonstrate word-finding difficulty, impaired fluency, loss of sentence melody, reduced syntactic capabilities, and impaired reading and writing [4]. These symptoms may present individually or in any combination.

One phenomenon, noted over centuries in those with non-fluent aphasia, is their ability to sing the words of a song much more clearly than they can speak them [5]. This is believed to be due to the right brain lateralization for certain aspects of music, such as singing [6,7], and helped lead to the advent of the speech therapy technique Melodic Intonation Therapy (MIT) [8,9]. MIT is a multi-step technique that attempts to utilize singing ability to help regain some level of functional speech. Clients advance through four different levels, from humming to short 2-3 word phrases, often picked from a list of the most commonly used words and phrases, and continuing up in difficulty. One must show a certain level of mastery at each level (at least 80% accuracy) before continuing to the next. In composing phrases the original authors stressed utilizing a small pitch range of three to four whole steps and demonstrated the use of a few different prosodic speech patterns. The small pitch range was thought to help differentiate between singing and speaking and was deemed to offer "…an adequate variety of melodic patterns. The range is only slightly greater than the range of inflection… " (Sparks & Holland, 1976, p. 289). Importance was also placed on the three areas where speech and singing intersect: melody, tempo and rhythm. This would seem to conflict with the notion of keeping to predetermined sets of pitches and prosodic speech patterns as normal speech patterns offer a variety of pitches, rhythms and tempi. As the technique has evolved, rather than addressing this contradiction, that small set of pitches has been whittled down in many cases to 2, an upper pitch for those words that would be accented and a lower pitch for the words of the phrase that were unaccented while the rhythm of the phrase has become exaggerated [10]. This method of composition leads to an intermediary step of speech-song, what the original authors liken to sprechgesang, to help transfer the learned melodic phrase to a more speech-like intonation, before attempting to speak the phrase. When utilizing MIT the therapist is encouraged to assist the client in tapping the rhythm with the client's left hand. Therapists are also discouraged from confronting mistakes, rather, ignore them and try again. If the

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client makes the same mistake then the therapist should move on.

In the decades since MIT's inception, there has been little consensus as to the clinical efficacy of the technique. Rather, debate has continued as to the actual mechanisms responsible for change and what aspects of MIT are, or are not, important in facilitating change. Many reports have described "modifications" to the initial protocol and clinical papers describe therapists modifying how they employ MIT with their clients [11,12,13]. This raises important questions. Why is it so difficult to find a consensus in the literature? What is best practice in using this technique to treat those with language impairment? With several "modifications" being employed are there areas in the protocol that are clinically limiting, and if so, how might those be addressed?

A possible reason for the lack of consensus is in approaching a multi-modal technique from only one mode. Recent reviews looked extensively at the neural mechanisms in speech recovery [14,15] and clinical applications [13,15] of MIT. As in much of the literature, these reviews discussed MIT as being an intervention utilized by Speech Therapists in treatment of Aphasia. While this is true, this may also provide a clue as to limitations in both the understanding and the implementation of a music-based intervention. While singing familiar songs alone shows little improvement in generalized speech following a stroke [16], the literature on speech recovery is sparse using speech-generated therapies that have a positive impact on generalized speech following an acquired speech deficit [17]. This is likely why there has been such an interest in deciphering how to utilize the knowledge of retained singing ability in those with impaired language. However, seldom are Music Therapists or music professionals mentioned in the literature.

Two potential means of language recovery [15,18,19] have been identified that encompass much of the recent, albeit conflicting, research findings. For those with non-fluent aphasia whose affected area is more focal, or localized, it is plausible that the adjacent areas to Broca's will respond to treatment and take up expressive speech function. However, in those individuals for whom their incidents are more severe, it is likely that only with improved right hemispheric activation will they see improvements to their speech and language functioning. Treatment would entail the development of these areas and helping the brain learn how to utilize them for everyday speech function.

MIT appears to take both of these models into account. However, the research looking at MIT and other intonation based treatments is varied. Questions have been raised regarding whether it is the melody or the rhythm that is important [13,20]. Should hand-tapping be utilized or not [19,21]? Is it more effective to exaggerate the rhythm and melody [8,13,14]? These are all music-based questions. Modified Melodic Intonation Therapy (MMIT) is an adaption of MIT utilized by Music Therapists and takes these questions into account. Using the information provided through the research literature, MMIT refines the original protocol to utilize what is functionally available to provide an efficient and effective means for aphasia treatment.

MMIT adapts the MIT protocol to more accurately reflect the idea of composing melodic phrases that approximate the spoken sentence. Doing so simplifies the protocol's steps, enables easier access to neural networks for both singing and language and is a key element in translating that phrase back to normalized speech. Imaging studies have demonstrated that prosody of speech (sometimes defined as the melody of speech) is primarily a right hemispheric, or unaffected side, process [22]. Therefore, developing melodic phrases that mimic the prosodic elements of the spoken phrase should more readily transfer back to speech. This entails utilizing all the pitches that are present in the target phrase as well as keeping the rhythm and tempo to match, making melody and rhythm equally important. Transferring the sung melodic phrases to spoken phrases is made easier by composing the phrases as close to the spoken sentence as possible meaning no intermediary steps. The fewer distractions there are to learning the phrase in its entirety the faster it can be generalized. For these reasons humming and hand tapping become superfluous and potentially inhibitory to the success of the therapy. The following section will discuss how MMIT was utilized by an in-home Music Therapy service working with clients with chronic non-fluent aphasia.

Clinical outcomes

This section describes treatment of seven individuals who were seen through an in-home Music Therapy service. All clients seen by this service sign consent forms prior to beginning treatment allowing the release of certain de-identified personal information for dissemination purposes. All clients in this paper had subsequent follow-ups to ensure the information being used was acceptable prior to the initial draft.

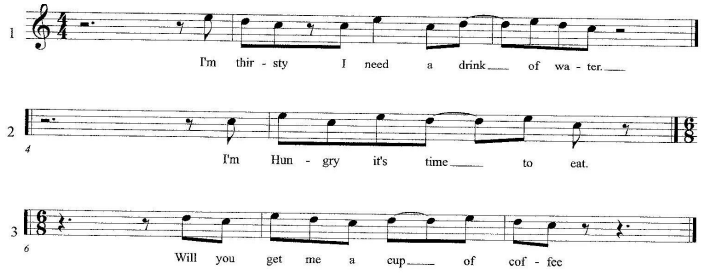
Of the seven, 5 were female, and clients' ages ranged from 56 to 81 years of age. Four of the clients were stroke survivors, two were diagnosed with Fronto-Temporal Dementia (FTD) and one was diagnosed with an unspecified dementia. All seven had moderate to severe non-fluent aphasia with two clients also demonstrating moderate apraxia of speech. Only one client was attending regular SLP visits which were primarily addressing non-verbal communication.

Treatment Sessions

Clients received 1-hour music therapy sessions 1-3x per week. Each session consisted of MMIT-based phrases and exercises with 1-2 familiar songs to provide a "break". The phrases were individually based, i.e. phone number, address, name, and a few generic phrases ('have to use the bathroom', 'I need a drink of water', etc.) (see Figure 1). The Music Therapist

(MT) modeled each phrase and encouraged the client to participate. As the client became familiar and proficient with singing a phrase the MT would alternate between the client singing and the MT singing. As the client demonstrated the ability to sing a phrase individually the MT would then model the phrase spoken and follow the same sequence in helping the client participate in speaking the phrase. As the client became more adept at producing these phrases, the MT verbally introduced different scenarios in which these phrases might be used.

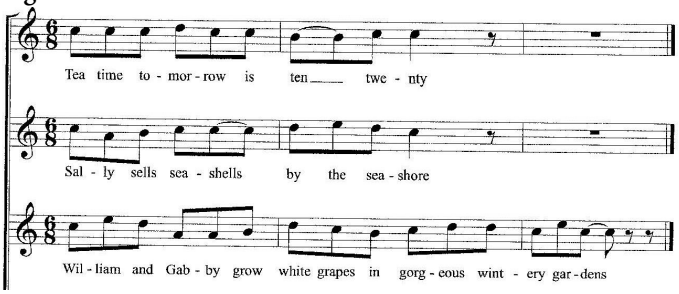
Figure 1.



Vocal/speech exercises were used to augment the work being done with the functional melodic phrases, often focusing on a particular phonemic part of speech or oral motor sequence. These were either familiar tongue twisters or those written by the therapist, and followed the same principles of composing the melodies to closely resemble the spoken phrase. Figure 2 demonstrates a few of these exercises.

If a client demonstrated increased frustration, fatigue or difficulty with a phrase or exercise, the MT would sing a song the client was familiar with. The MT would sing the verses and instruct the client to sing during the chorus. When the song was complete the MT would instruct the client to speak the words to the chorus of the song, after which the MT continued with either a melodic phrase or exercise.

Figure 2.



No humming or hand tapping was done with any of these clients.

Assessment

This Music Therapy service utilizes the Bedside Western Aphasia Battery for speech assessments. The Western Aphasia Battery (WAB) is a widely administered assessment tool for aphasia. The Bedside WAB is a shorter version of the full WAB and is most often used as a diagnostic tool in hospitals. The reduced time to complete the Bedside WAB helps to diminish fatigue and frustration that can present during the full WAB, which is often administered over multiple sessions or with long breaks, while still providing the assessment information necessary to determine level of impairment in speech and language production. Each of the six individual sections are scored 0-10 and the overall score is a composite ranging from 0-100. An improvement of 5 points in the overall score of the WAB is considered clinically significant. However, no standards are set for the bedside WAB. Number of client visits varied from initial assessment to their follow-up assessment based on their clinical schedules and contractual agreements at beginning of treatment. The range of sessions between initial and follow up assessments was 4 to 51 sessions. All initial and follow up assessments were administered by the treating therapist.

Clinical Results

Table 1 shows the results of the seven individuals following MMIT treatment. No formal statistical analyses were performed; rather, the table demonstrates changes in scores for each individual from their initial assessment to their follow-up assessment. Included in this breakdown are the scores for each of the six individual sections of the bedside WAB, as well as the total composite scores for each client. All clients, despite being of varying levels of verbal impairment (initial total scores ranged from 22.5 to 62.5), time in recovery (time of diagnosis to initial assessment ranged from 7 to 24 months) and etiology (4 stroke, 2 FTD and 1 Dementia: unspecified), showed marked improvements from initial assessment to follow-up. All changes in total scores improved, ranging from an increase of 7.5 points to 32.5 (total scores at follow up ranged from 30 to 84). While not all clients showed improvement in every individual section of the bedside WAB, all clients demonstrated improvements in both word finding and initiation of speech, two of the more limiting difficulties in those with non-fluent aphasia.

Table 1

Table 1: Clinical Comparisons of Patients with Chronic Aphasia receiving MMIT treatment

Client	1		2		3		4		5		6		7	
Age/Sex	81/Female		80/Female		60/Male		56/Male		67/Female		70/Female		72/Female	
Diagnosis	L-CVA		L-CVA		L-CVA		L-CVA		FTD		FTD		Dementia	
Time from diagnosis	22 Months		17 months		7 months		12 months		24 Months		14 months		12 months	
# of Sessions	16		51		17		46		17		18		4	
Bedside WAB	Initial	Follow	Initial	Follow	Initial	Follow	Initial	Follow	Initial	Follow	Initial	Follow	Initial	Follow
Total Score	62.5	72.5	25.8	46.6	35	53	45	77.5	51	66	59.5	84	22.5	30
Verbal Content	1	7	0	1	0	4	3	7.5	3	6	4	9	1	1
Verbal Fluency	3	4	3.5	3.5	2	4	4	5.5	4	4	2	6	2	3
Comprehension: Yes/No	10	10	5	9	8	9	7	10	3	6	5	8	8	10
Sequential Commands	9	8.5	5	7	7	6	2	7	6	5	5	8	0	0
Repetition	4.5	4	2	6	4	5	3	7	5	9	10	10	2.5	3.5
Object Naming	10	10	0	2	0	3.5	8	9.5	9.5	9.5	9	9.5	0	0.5

Discussion

This paper has contrasted a modification of the Speech Therapy technique Melodic Intonation Therapy (MIT), discussed its implementation within an in-home Music Therapy service and subsequent results with 7 clients. While an adaptation of MIT, the changes in Modified Melodic Intonation Therapy (MMIT) clearly redefine how the technique is conceptualized and implemented. The results from the clinical examples provided demonstrate (albeit a small sampling) that when used as the primary therapeutic tool for speech recovery, MMIT has the potential to yield consistent positive results. It therefore bears more distinction than simply stating it is another "modified version" of the MIT protocol. A Music Therapist working with a client with non-fluent aphasia is likely working predominantly on language re-acquisition for improved speech production, while a Speech Language Pathologist working with the same client may be addressing a myriad of communication goals. Distinguishing between MIT and MMIT helps denote for therapists and clients what the expectations are from the process, both in delivery and outcomes.

When developing MMIT phrases, functionality and ability are the primary directors, allowing for more flexibility in the length and types of phrases that are used. When a client has demonstrated they can sing a few lines of a familiar song there is no reason to believe they cannot do the same with a functionally relevant melodic phrase. This allows the client to proceed at their own pace, while keeping the therapeutic focus on speech production. This contrasts with the steps followed in MIT, from humming to 2-3 word phrases and forward. Under the MIT model it could be some time before treatment entails material personally relevant to the individual client and is more therapist driven rather than client driven. The results from the clients discussed demonstrate the individuality of speech recovery.

Speech recovery can be a very frustrating and arduous process for those suffering from non-fluent aphasia. Research looking at stroke rehabilitation demonstrates little speech recovery after 6 months post stroke with virtually none after 12 months [23]. This can leave stroke survivors feeling helpless, potentially leading to withdrawal, anger, and depression. Our results demonstrate positive outcomes well after that time frame. MMIT has the ability to demonstrate for clients that they can produce meaningful words and phrases early in the treatment, regardless of where they are in their recovery process. From a psychological standpoint this increases motivation and hope: two things that lead to better outcomes, but diminish rather quickly in the aphasia community.

The consistent result in our report was that all clients improved in their overall scores. However, when looking at the individual changes, levels of improvement could not be predicted by number of sessions, etiology, gender, or time from diagnosis. As all clients were seen by the same therapist, that factor likely did not change the outcomes. This furthers the argument for MMIT being effective for a wide range of clientele and levels of recovery. While current models of MIT show improvement after 75 sessions [10] the data provided demonstrates improvement with MMIT can occur in a much shorter time (the longest period was 51 sessions), leading to more cost-effective treatment. When coupled with previous research done in the acute phase of stroke recovery with MMIT [24], use of MMIT throughout the recovery phase has the potential to yield much greater rates of recovery then most current models.

A point of discussion has been generalizability vs training effect [20]. We would posit this is both a training effect and generalizable. In any person with aphasia, the template their brain has used for language acquisition and production is damaged and so it must learn a new one. MMIT accesses

functioning areas of the brain for speech production and seeks to generalize the phrases used. From a neural learning model it is more efficient than its predecessor. Through the prosodic elements and its repetitious nature, this model allows for the new template to be set in place, and as in any skill management, the more a person utilizes this new template the easier and more natural the skill of verbal production will become. Going back and forth between both singing and speaking will allow for more secure connections to the words/phrases being produced in both modalities, and strengthen new communication networks. Confronting errors, discouraged in MIT, allows clients to get re-accustomed to self-correction and re-develop the skill of hearing correct and incorrect utterances.

Early intervention in Fronto-Temporal Dementia seldom occurs, with many families getting correctly diagnosed only after specific symptoms have manifested enough to warrant looking at an fMRI or CT scan. There is currently no cure and most pharmaceuticals offer moderate relief with a myriad of possible side effects. While only a small sample, the results from the 2 clients with FTD warrant further investigation.

Based on the growing body of evidence, both neurologically and clinically, it is not surprising that MMIT can be utilized successfully in a variety of diagnoses with symptoms that include non-fluent aphasia, including a non-specified dementia. A treatment successfully utilizing intact right hemisphere structures has the potential for positive outcomes when the left hemisphere is compromised. More research and clinical reporting is warranted in this area.

Conclusions

This paper has demonstrated positive clinical outcomes utilizing the treatment technique Modified Melodic Intonation Therapy (MMIT) with a variety of clients. While this paper has reported on clients in the chronic stage, coupled with previous research showing positive results at the acute stages of aphasia [24], the discussion can, and should, be extended to utilizing MMIT throughout the recovery process. As a clinical report this paper provides important information regarding the potential of MMIT in chronic aphasia that will hopefully spur more refined research protocols to corroborate its efficacy and reliability. As both MIT and MMIT are multi-modal in nature, utilizing areas of music and speech, greater emphasis on collaborative efforts should be made in future clinical and research methodologies.

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