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The Effectiveness of Melodic Intonation Therapy on English Speaking Adults with Expressive Aphasia

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Abstract

Melodic Intonation Therapy (MIT) has been a resource for working with adults with aphasia since 1973 when Albert, Helm and Sparks created this music-based intervention. MIT involves intoning short utterances while simultaneously using the left hand to tap the rhythm of syllables. This research project investigates the effectiveness of MIT intervention for an aphasic population. This was experimental research using a pre-test - post-test between subjects single design including two males presenting with aphasia (n=2). They participated in a controlled intervention during a 12 week period of cognitive therapy. The first six weeks of the intervention program consisted of language and cognition intervention only (LCI) while the second six weeks consisted of LCI with MIT (LCIM). Results revealed the post test for LCIM was the single factor that was moving towards significance as was indicated in the p of 0.07. MIT was somewhat effective in making a significant impact on more basic cognitive language skills, such as repetition, naming and word finding, when compared to higher functioning skills, such as spontaneous speech and auditory verbal comprehension. This was evident in patterns observed in growth of scores of formal and informal measures for the two participants in this research.

Keywords: Aphasia; Melodic intonation therapy; Speech language pathology

Introduction

Though some speech language pathologists recognize the effectiveness of Melodic Intonation Therapy (MIT), a lack of sound scientific research on its effectiveness prevents MIT from being incorporated into mainstream practice. MIT involves intoning short utterances while simultaneously using the left hand to tap the rhythm of syllables [1,2].

The purpose of this research was to investigate the effectiveness of MIT intervention when administered to individuals with expressive aphasia. Goals were to expand the professional knowledge base available and facilitate the acceptance of MIT as an evidence-based treatment. Multiple case studies have shown positive results using MIT intervention.

Yet, Hough et al. [3,4] recommended that additional investigations are warranted to explore its effectiveness before the MIT method can be considered an evidence based practice.

Significant Literature

Research regarding MIT has identified various patterns that have emerged as mentioned by Zumbansen et al. [5]. Salient outcomes for MIT were identified as the promotion of verbal productions via the facilitation of a melody and graduate progression of decreased cueing (i.e. unison, unison with fading, immediate repetition, delayed repletion and response to a question) leading towards an independent production of intoned speech [5,6]. These two outcomes are discussed below.

Verbal productions through melody

Zumbansen et al. [5] found through their review of MIT literature (14 publications) that verbal productions were the outcomes of the structured use of MIT in its original form. The concept of efficacy in the MIT intervention was discussed revealing that SLP professionals attempt to stay true to the basic foundational concept of MIT, but variations occurred. These variations are allowed because MIT's original author's encouraged differential adaptation of the MIT protocol to fit the patient's needs [5].

Hough [3] adapted the MIT protocol by removing the left-hand tapping portion because of the participant's difficulty with gross motor movement as a result of the cerebrovascular accident causing his aphasia. Hough [3] case participant was seen for three hours per week for eight weeks. After the first four weeks of treatment, he met criterion of 75% for automatic phrases. He was able to maintain this progress through the remainder of therapy and maintained improvements in automatic phrases and self-generated phrases at follow-up.

Sandt-Koenderman et al. [7] investigated MIT efficacy in a female with severe non-fluent (Broca's) aphasia who presented with a right-sided hemiplegia by adapting the intensity of the intervention. The onset of aphasia was two weeks post stroke. The client underwent intensive MIT training, for five hours a week for eight weeks [7]. An improvement was noted in the production of spontaneous speech, repetition, and labelling objects.

In addition, the study indicated that the left hemisphere was activated more than the right, following MIT treatment. There was no supported difference between spoken and melodic language [7]. The conclusion of the case study revealed increased verbal output in this female participant with no increase in activity in the language centers of the right hemisphere. This study showed MIT treatment actually suppressing the activation of the right hemisphere during the period of

early recovery of aphasia rather than stimulate it, but supported recovery of the language centers of the left hemisphere [7].

Norton, et al. [8] uncovered the effects of MIT on an 11 year old girl with extensive left-hemisphere lesions. A unique characteristic of this case study is that it was conducted on an adolescent rather than the typical adult or elderly candidate for MIT. Since the participant was younger than the average entrant for MIT treatment, this study sought to identify whether the plasticity processes would enhance treatment in a person of her age [8].

Stated goals were to test the efficacy of their adaptation of MIT, and to look for structural and functional changes supporting MIT induced improvement, since no left-hemisphere areas remain to support recovery of speech function [8]. MIT was begun 15 months post-stroke, after 15 months of traditional speech therapy spanning 80 sessions totalling 120 hours of treatment therapy in 90 minute sessions five times a week. During the course of treatment, the participant's ability to produce fluent verbal productions and maintain conversation improved with treatment and gains were maintained eight weeks post treatment. fMRI studies showed an increase in the right hemisphere supplementary motor areas which peaked eight weeks into treatment and decreased slightly after an additional eight weeks of MIT treatment [8].

Decreased cueing for independent verbal productions

These aforementioned researchers followed the MIT protocol implementing the phases of MIT (Phase I and Phase II) and naturally decreased cues to promote independent verbal productions. This was demonstrated by Hough [3] stating his case participant increased in naming, auditory comprehension, and spontaneous speech ability along with his reading and writing skills. Automatic phrases and self-generated phrases were found to increase during follow ups and the participants spouse reported increases in perception and communication effectiveness.

Norton et al. [8] demonstrated a movement towards decreased cues and the resulting outcome when they stated their young participant's ability to produce fluent speech and maintenance of conversation improved with treatment. Gains were maintained eight weeks post treatment. Sandt-Koenderman et al. [7] indicated increases as improvement was noted in the production of spontaneous speech, repetition, and labelling objects.

Wilkinson et al. [9] identified generalization as a component of MIT through a case study with a female participant with late onset non-fluent aphasia. This participant was identified as an MIT candidate as she exhibited slow effortful speech, sound errors and distortions, good auditory comprehension and had an enthusiastic attitude about therapy [9]. During MIT treatments, the individual with non-fluent aphasia was presented with a declarative sentence both verbally and in print. She was then instructed to form a wh-question that went with the presented sentence. The treatment was administered three times a week for up to 20 treatment sessions [9]. Stated results of this study were increases in trained and un-trained who questions, with varying and less substantial gains in what, when and where questions which were spontaneous productions on the participants part [9-11].

MIT has as its largest component the use of melody, rhythm, and synchronicity [12,13]. As demonstrated by the above diverse cases, the melody component continues to arise and is supported by both major reviewers of MIT literature. Ultimately, the fading of cues is the clinicians focus when engaging in intervention. Fading of cues leads to generalization which MIT has support for impacting generalization with early and late onset patients with aphasia [3,7-9,14].

Methodology

For the purposes of this study, a quantitative research design was used through the use of descriptive observational variables. This was experimental research using a pre-test - post-test case between subjects design. This design was selected because Gall et al. [15] affirmed that it "effectively controls for the eight threats to internal validity originally identified by Campbell and Stanley: history, maturation testing, instrumentation and statistical regression, differential selection, experimental mortality and selection-maturation interaction" (p. 392).

Participants were a convenience sample found at a public university speech and hearing clinic. Inclusion criteria consisted of English speaking adults with a right-hemisphere lesion. There were a total of two individuals that agreed to be participants in this project (n=2), one of Anglo ethnicity and one of Hispanic ethnicity. Both participants presented with late onset expressive aphasia and had been receiving speech therapy services at the university speech and hearing center for the past year. Participant 1 presented with a mild to moderate expressive aphasia characterized by difficulties with word finding, writing and ability to retell recent events with clarity. Participant 2 presented with a moderate to severe expressive aphasia characterized by difficulties with word finding, sentence formulation, repetition and auditory verbal comprehension.

Both participants engaged in a controlled intervention during a 12 week period of cognitive therapy. For the first six weeks, the participants received Language and Cognition Intervention (LCI) only. LCI consisted of commonly used strategies when working with adults with aphasia such as the use of repetition, modelling, corrective feedback, visual imagery, along with varied levels of multi-modal cueing. Materials used during intervention consisted of picture cards, narrative excerpts and hands on activities.

After a three week break between universities semesters, the second intervention was implemented. For the second six weeks MIT was implemented in addition to continued Language and Cognition Intervention (LCIM). MIT is designed to engage the right hemisphere regions involved in speech production through the combination of intoning simple utterances and rhythmic left-hand tapping [1]. MIT has been shown to increase verbal output by engaging preserved language ability in the homologous right hemisphere of the brain [2]. In this treatment, the natural prosody of speech is exaggerated while stressed and un-stressed syllables are intoned on two different pitches.

During the progression of treatment, the clinician guides the patient through four increasingly complex levels, which increase fluency while gradually reducing the need for support from the clinician [5]. Participants were pre-tested and post-tested by graduate research assistants with the Western Aphasia Battery (WAB), a formal assessment. The WAB provides an aphasia quotient and scaled scores for the areas of spontaneous speech, auditory verbal comprehension, repetition, naming and word finding. Informally, the Shipley and McAfee [9] Form 12.4 was administered for additional data. Form 12.4 provides percentage accuracies in a criterion-referenced format for the following subtests: recognition of words, naming words, recognition of object function, yes/no questions, repeating phrases, logic questions, sequencing, definition of terms, number recognition, numeric recognition, reading words and sentences orally and writing words and sentences.

Results

A one-sample t-test was utilized to assess whether the mean of the distribution differed significantly [15]. Furthermore, in order to answer the final research question, descriptive statistics were used to identify measures of central tendency. A t-test was utilized to compare means; therefore, one null hypothesis was established. The null hypothesis was that the use MIT had no effect on increasing cognitive skills in individuals identified with Aphasia.

During pre-test assessment, the independent-samples t-test analysis revealed the 2 participants had a mean of 71.10 for LCI in the WAB Aphasia quotient. At post-test assessment, the independent-samples t-test revealed a mean of 76.35 for the LCI resulting in a standard deviation of 18.88. LCIM t-test analysis revealed a pre-test mean of 76.35 and a post-test mean of 81.50 resulting in a standard deviation of 12.87. Standard error mean was identified as reduced, 9.10 compared to 13.35 at post-test, respectively, for LCIM and LCI. The statistical analysis for this study was completed utilizing an alpha level of 0.05. The test for equality of variances indicated that the variances for the two participants did not differ significantly from each other at the four points of analysis for LCI and LCIM (p=0.12, p=0.11, p=0.11, p=0.07). The post-test for LCIM was the single factor that was moving towards significance as is indicated in the p of 0.07.

Tables 1 and 2 depict the WAB subtests and participants scores at the four points of assessment administered during this investigation. Subtest scores demonstrated a steady increase in the performance of participant 2 in the areas of spontaneous speech, auditory verbal comprehension, repetition, naming and word finding. Participant 1 maintained his performance in the aforementioned subtests and did not demonstrate significant increases or decreases throughout this investigation according to the WAB assessment.

Tables 3 and 4 depict the percentage accuracies of correct responses for each participant in the individual subtests of Form 12.4 of the McAfee [16] informal assessment including: recognition of words, naming words, recognition of function, yes/no questions, repeating phrases, logic questions, sequencing, definition of terms, number recognition, numeric recognition, reading words and sentences orally and writing words and sentences.

This informal assessment supported the results of the WAB depicting a maintenance of skills for participant 1 through LCI (8/12 subtests) and LCIM (9/12 subtests) and an increase in skills in participant 2 through both LCI (8/12 subtests) and LCIM (6/12 subtests).

Participant 1 increased in 4/12 subtests during LCI and 2/12 during LCIM. Of note for participant 2 were the increases observed in the area of sequencing through the trajectory of the investigation. Participant 2 increased in sequencing skills from 20% accuracy to 100% accuracy at the completion of the investigation while participant 1 remained stagnant at 80% throughout the administration of this sequencing subtest.

Aphasia Quotient	**Pre-test**	**Post-test**
Participant 1	84.5	89.7
Participant 2	57.7	63
Spontaneous Speech		
Participant 1	16	17
Participant 2	12	14
Auditory Verbal Comp		
Participant 1	9.25	9.95
Participant 2	8.05	7.4
Repetition		
Participant 1	9.3	9.5
Participant 2	4.4	4.6
Naming and Word Finding		
Participant 1	7.7	8.4
Participant 2	4.4	5.5

Table 1: Western aphasia battery LCI scores.

	Pre-test	**Post-test**
Aphasia Quotient		
Participant 1	89.7	90.6
Participant 2	63.0	72.4
Spontaneous Speech		
Participant 1	17	17
Participant 2	14	17
Auditory Verbal Comp		
Participant 1	9.95	10
Participant 2	7.40	7.7
Repetition		
Participant 1	9.5	10
Participant 2	4.6	5.6
Naming and Word Finding		
Participant 1	8.4	8.3
Participant 2	5.5	5.9

Table 2: Western aphasia battery LCIM scores.

	Pre-test	**Post-test**
Recognition of Words		
Participant 1	100%	100%
Participant 2	92%	100%
Naming Word		
Participant 1	100%	100%
Participant 2	92%	100%
Recognition of Object Function		

Participant 1	83%	92%
Participant 2	92%	92%
Yes/No Questions		
Participant 1	100%	100%
Participant 2	80%	80%
Repeating Phrases		
Participant 1	100%	100%
Participant 2	39%	44%
Logic Questions		
Participant 1	100%	88%
Participant 2	38%	63%
Sequencing		
Participant 1	80%	80%
Participant 2	20%	40%
Definition of Terms		
Participant 1	54%	31%
Participant 2	23%	31%
Number Recognition		
Participant 1	100%	100%
Participant 2	25%	42%
Numeric Recognition		
Participant 1	100%	100%
Participant 2	53%	20%
Reading Words and Sentences Orally		
Participant 1	100%	100%
Participant 2	30%	30%
Writing Words and Sentences		
Participant 1	20%	10%
Participant 2	30%	20%

Table 3: LCI percentage scores McAfee form 12.4.

	Pre-test	**Post-test**
Recognition of Words		
Participant 1	100%	100%
Participant 2	100%	100%
Naming Word		
Participant 1	100%	100%
Participant 2	100%	100%
Recognition of Object Function		
Participant 1	92%	100%
Participant 2	92%	100%
Yes/No Questions		
Participant 1		
Participant 2	80%	100%
Repeating Phrases		
Participant 1	100%	100%
Participant 2	44%	39%
Logic Questions		
Participant 1	88%	88%
Participant 2	63%	63%
Sequencing		
Participant 1	80%	80%
Participant 2	40%	100%
Definition of Terms		
Participant 1	31%	38%
Participant 2	31%	31%
Number Recognition		
Participant 1	100%	100%
Participant 2	42%	50%
Numeric Recognition		
Participant 1	100%	100%
Participant 2	20%	47%
Reading Words and Sentences Orally		
Participant 1	100%	100%
Participant 2	30%	50%
Writing Words and Sentences		
Participant 1	10%	0%
Participant 2	20%	30%

Table 4: LCIM percentage scores McAfee form 12.4.

Discussion

The significance of this research is that it provided evidence regarding the effectiveness of the MIT intervention strategy. Speech language pathologists benefit from a controlled study investigating these methods in that they have some indication of an "evidence-based practice" to the use of this method. Participant 1 was diagnosed with mild expressive aphasia and he progressed minimally during the six weeks of pre-experimental treatment. His level of interest waning when it came to the MIT method may have been a factor. This was evidenced

by frequent yawning and looking at a wall clock and his watch throughout the session. During administration of LCIM, participant 1 appeared to have plateaued after implementation LCI. Participant did not progress further than 0.05 to 1 point in his WAB scores.

Participant 2 presented with moderate-severe aphasia and his speaking abilities continued to improve during LCIM. Specifically, participant 2 increased 9.6 points in his WAB aphasia quotient during the LCIM intervention. Unlike participant 1, he appeared focused during the MIT portion of therapy as was evidenced by forward posture, frequent smiling, and verbal self-assessment.

As a result of this investigation, it was found that MIT may be effective in making a significant impact on more basic cognitive language skills, such as repetition, naming and word finding, when compared to higher functioning skills, such as spontaneous speech and auditory verbal comprehension as was seen in participant 2. This was evident in patterns observed in growth of scores for the two participants in this research due to the sensitivity of the WAB to measure changes in patient performance when administered consistently. Repetition, naming, and word finding growth was consistent between the two participants, but in other categories the growth was varied. For example, changes in spontaneous speech were dynamic for one participant and static for the other. However, waves for the two notable categories follow a similar shape, or progress, when graphed. The same amount of growth during non-MIT intervention, using traditional aphasia therapy, was noted for both participants. A reasonable assumption is that MIT has a strong impact on automatic speech tasks with basic neural functions. Additionally, no noteworthy impact was seen for auditory verbal comprehension.

Recommendations for Further Research

Further study is warranted on the effect of MIT on basic cognitive language skills. It would be interesting to know if language skills such as repetition, naming and word finding share similar neural pathways.

Current research has highlighted the need for further study in the treatment of individuals who are bilingual or multilingual, and are diagnosed with aphasia. When comparing the recovery of monolingual to bilingual individuals, there are two main areas of interest. These are recovery patterns and paralinguistic features, such as intonation patterns of a secondary language, which may influence the effect of MIT [17-19].

Lorenzen et al. [20] briefly describe seven different recovery patterns for individuals who are bilingual and present with aphasia, they refer to the manner in which individuals with aphasia may recover and are parallel, differential, antagonistic, alternating antagonism, blending, selective, and successive. There is not enough information to support the effectiveness of treatments for individuals with these characteristics, and more research is needed in these areas to make treatment more effective.

In addition to the recovery patterns, executive functions of the brain have been found to work with more intensity in bilingual individuals with aphasia than in similar monolingual individuals [21]. Furthermore, there are also thoughts among researchers about intonation patterns of different languages, aside from English, which may also have an impact on the efficacy of MIT. It is believed that using this MIT with patients who are bilingual and have stronger executive functions throughout their brain, will engender rapid recovery when compared to monolingual persons. There is still much research to be conducted before the effect of bilingualism in the treatment of non-fluent aphasia with MIT is known.

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