NORTHERN ILLINOIS UNIVERSITY

Modified Melodic Intonation Therapy for Aphasia

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

With Upper Division Honors

Department Of

Allied Health and Communicative Disorders

By

Elizabeth Di Zenzo

DeKalb, Illinois

Spring 2013

University Honors Program

Capstone Approval Page

Capstone Title (print or type)
Modified Melodic Intonation Therapy for Aphasia

Student Name (print or type) Elizabeth Di Zenzo

Faculty Supervisor (print or type) Jamie Mayer

Faculty Approval Signature

Department of (print or type) Allied Health and Communicative Disorders

Date of Approval (print or type) 4/26/13

HONORS THESIS ABSTRACT
THESIS SUBMISSION FORM

AUTHOR: Elizabeth Di Zenzo

THESIS TITLE: Modified Melodic Intonation Therapy for Aphasia

ADVISOR: Dr. Jamie Mayer

ADVISOR'S DEPARTMENT: Allied Health and Communicative Disorders

DISCIPLINE: Speech-Language Pathology

YEAR: 2012-2013

PAGE LENGTH: 16

BIBLIOGRAPHY:

Conklyn, D., Novak, E., Boissy, A., Bethoux, F. and Chemali, K. (2012). The Effects of Modified Melodic Intonation Therapy on Nonfluent Aphasia: A Pilot Study. *Journal of Speech, Language and Hearing Research,* 55, 1463-1471.

Hough, M. (2010). Melodic Intonation Therapy and Aphasia: Another Variation on a Theme. *Aphasiology,* 24, 775-786.

Long, S. (2008). MaUSECat: Marquette University Spanish English Catalog [Software]. Available from http://computerizedprofiling.org/MaUSECat/index.php

McNeil, Odell, & Tseng (1991). Toward the Integration of Resource Allocation into a General Theory of Aphasia. *Clinical Aphasiology*, 20, 21–39.

Schlaug, G., Marchina, S., & Norton, A. (2008). From Singing to Speaking: Why Singing May Lead to Recovery of Expressive Language Function in Patients with Broca's Aphasia. *Music Perception,* 25, 315-323.

Schlaug G., Norton, A.C., Marchina, S., Zipse, L., & Wan, C.Y. (2010). From Singing to Speaking: Facilitating Recovery From Nonfluent Aphasia. *Future Neurology,* 5, 657-665.

Sparks, R. W. (2001). Melodic Intonation Therapy. In Chapey, R. (Ed.) *Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders*. Philadelphia: Lippincott Williams and Wilkins.

Vines, B.W., Cornell, Norton, A.C., & Schlaug G. (2011). Non-Invasive Brain Stimulation Enhances the Effects of Melodic Intonation Therapy. *Frontiers in Psychology: Auditory Cognitive Neuroscience,* 2, 1-10.

Wan, C.Y., Rüber, C., Hohmann, A., & Schlaug, G. (2010). The Therapeutic Effects of Singing in Neurological Disorders. *Music Perception,* 27, 287-295.

ILLUSTRATED: NO

PUBLISHED (YES OR NO): NO

LIST PUBLICATION:

COPIES AVAILABLE (HARD COPY, MICROFILM, DISKETTE): Hard copy, computer file

ABSTRACT (100-200 WORDS):

Aphasia is the impairment in the ability to express or comprehend language resulting from brain injury. Some patients with aphasia may benefit from intonation-based therapy because it has been observed that these patients often generate well-articulated words while singing, rather than while speaking. Melodic intonation therapy (MIT) is a treatment that emphasizes melodic aspects of speech in a hierarchy of progressively difficult tasks. The purpose of this study was to determine whether a modified version of MIT that trained frequent and highly visual verbs and nouns in structured phrases would be more effective in improving propositional speech in an individual with severe aphasia than would a more traditional MIT

design that used functional, less visual, and more variable phrases. The modified MIT program consisted of eight sessions over a two-week period, and trained three sets of stimuli that included 15 items for each set (15 nouns, 15 verbs, and 15 noun-verb phrases). Results reflected a general trend of improvement in the individual's responses, suggesting the possibility that the use of visual cues and highly imageable phrases can be an effective modification in MIT for improving speech in individuals with severe aphasia.

Modified Melodic Intonation Therapy for Aphasia

Elizabeth Di Zenzo

Northern Illinois University

Abstract

Aphasia is the impairment in the ability to express or comprehend language resulting from brain injury. Some patients with aphasia may benefit from intonation-based therapy because it has been observed that these patients often generate well-articulated words while singing, rather than while speaking. Melodic intonation therapy (MIT) is a treatment that emphasizes melodic aspects of speech in a hierarchy of progressively difficult tasks. The purpose of this study was to determine whether a modified version of MIT that trained frequent and highly visual verbs and nouns in structured phrases would be more effective in improving propositional speech in an individual with severe aphasia than would a more traditional MIT design that used functional, less visual, and more variable phrases. The modified MIT program consisted of eight sessions over a two-week period, and trained three sets of stimuli that included 15 items for each set (15 nouns, 15 verbs, and 15 noun-verb phrases). Results reflected a general trend of improvement in the individual's responses, suggesting the possibility that the use of visual cues and highly imageable phrases can be an effective modification in MIT for improving speech in individuals with severe aphasia.

Acknowledgments

I would like to thank my professor, Dr. Jamie Mayer, for her mentorship and support. Without all of her generous guidance, this study would not have been possible.

Introduction

Every year, over 150,000 people in the U.S. acquire aphasia after suffering a stroke. Aphasia is the impairment in the ability to express or comprehend language resulting from brain injury (Vines, Norton, & Schlaug, 2011). Aphasia can be divided into fluent and non-fluent. Fluent types are characterized by the ability to speak with normal prosody and articulation, but utterances may be semantically flawed. Individuals with non-fluent aphasia speak short utterances containing pauses and exert great effort while speaking. One type of non-fluent aphasia, known as Broca's aphasia, is characterized by the impaired ability to speak, but the intact ability to understand. This condition is the result of damage to Broca's area, the portion of the brain in the left inferior frontal gyrus (Wan, Rüber, Hohmann, & Schlaug, 2010). Patients with Broca's aphasia may benefit from intonation-based therapy because it has been observed that these patients often generate well-articulated words while singing, rather than while speaking (Schlaug, Norton, Marchina, Zipse, & Wan, 2010).

One intonation-based treatment, melodic intonation therapy (MIT), emphasizes melodic aspects of speech in a hierarchy of progressively difficult tasks. MIT is recommended for patients with non-fluent aphasia because the treatment strives to engage undamaged areas of the left and right hemispheres through singing and left hand-tapping in an attempt to facilitate the creation of new connections across both hemispheres (Schlaug et al., 2010). In a study by Schlaug, Marchina, and Norton (2008), two patients who underwent 40 sessions of MIT after suffering left-hemispheric strokes demonstrated significant improvement in speech output and picture-naming tasks. Although the cause of increased word production facilitated by MIT has yet to be accurately explained, Schlaug and colleagues suggest that the strongest contributors to these beneficial effects may be sustained vocalization and left hand-tapping. It is hypothesized

that these two elements may activate a sensorimotor network in the right hemisphere, coordinating both hand and articulatory movements, suggested by noted changes in treatment-associated imaging in the patients. Utilizing these mechanisms, MIT promotes the recovery of patients with left-hemispheric brain lesions (Schlaug et al., 2008).

The MIT program is defined by a specific protocol. Guided by the clinician, the patient taps his or her left hand and intones words using two pitches: a higher pitch for naturally stressed syllables and a lower pitch for naturally unstressed syllables (Schlaug et al., 2010). Words and phrases are trained at four levels, over which phrase length increases and clinician support decreases. At level one, the clinician hums the melodic pattern of each phrase while the patient taps his or her left hand to help familiarize the patient with the correct rhythm. At level two, the patient continues hand-tapping. The clinician intones a phrase and signals the patient to join in unison. The clinician signals the patient to listen, presents the intoned phrase, and then signals the patient to repeat unaccompanied. At level three, the clinician follows the same steps from level two, but adds questions to the last step to elicit the target phrase. Level four utilizes an intoned speech technique called "Sprechgesang" to transition the phrases into normal prosody. The clinician intones the phrase, pauses, and then presents the phrase in Sprechgesang twice. He or she signals the patient to repeat, presents the phrase in normal prosody, and signals the patient to repeat again. In the last step, questions are asked in normal prosody to elicit the target phrase (Sparks, 2001). For optimal results, MIT is administered intensively, during a time span of eight weeks or less (Hough, 2010).

In a 2012 study by Conklyn, Novak, Boissy, Bethoux, and Chemali, the effects of MIT on non-fluent aphasia were measured in 30 acute stroke survivors. Participants met with a music therapist for two sessions. Noticeable improvements in expressive language were observed after

the first session. The significant differences between pre- and post-test data suggested that participants who received therapy displayed greater positive changes in repetition and responsiveness than the control group. This study further demonstrates the credibility of MIT as an effective treatment plan for non-fluent aphasia (Conklyn et al., 2012).

The purpose of this study was to determine the optimal method of administering MIT to an individual with non-fluent aphasia in order to increase comprehension, thereby increasing propositional speech. This study is the second part of a larger study designed to explore what aspects of MIT were most beneficial for an individual with severe aphasia, and therefore the data reported in this paper are meant to be compared to other data (Mayer, unpublished) for the final determination of how to best modify MIT to accommodate this population. For the purposes of this study, the treatment program was modified to eliminate factors that may have contributed to the failure to elicit target responses by presenting visual cues with each stimulus item and increasing the number of highly visual phrases. The phrases contained highly imageable nouns and verbs that were initially trained separately through each level of the hierarchy. Adding visual cues and increasing the number of high imageability phrases were thought to help the participant better comprehend the meaning of each phrase and, accordingly, increase the likelihood of eliciting appropriate responses.

Methods

Participant

The participant for this study was JP, a man with severe non-fluent aphasia caused by a stroke. He was classified as having Broca's aphasia, but performed poorly on auditory comprehension tests. The goal of this study was to explore whether a modified version of MIT that emphasized comprehension and production of frequent and highly visual verbs and nouns in

structured phrases (e.g., "He is eating.") would be more effective in improving propositional speech compared to a more traditional implementation of MIT that uses frequent but less visual and more variable phrases (e.g., "I'm hungry". "See you later".). Due to JP's weak comprehension skills, only common, highly visual words and phrases were taught during therapy, rather than phrases that may be more difficult to envision. Teaching him more commonly used words and phrases for his everyday life was thought to increase the likelihood of success and his desire to continue with therapy.

Treatment

The modified MIT program consisted of eight sessions over a period of two weeks, with four sessions per week. The duration of each session was between two and three hours. Two to four sessions were required to progress through each level. Each session (with the exception of the first) began with presenting 15 videos, each describing a verb. JP was instructed to name the verb shown in each video, and these data were used to monitor progress throughout the study. JP was taught three sets of stimulus items that included 15 items for each set (15 nouns, 15 verbs, and 15 noun-verb phrases). The same sets of stimuli were taught throughout and are presented in Table 1. Some stimulus items without matching nouns, verbs, or phrases within the set were chosen for their high frequency and imageability. Using pictures from online image search engines and videos from Marquette University Spanish-English Catalog (Long), these trained stimulus items were presented in ways that would increase the likelihood that JP would be able to comprehend their meanings. The method of categorization of the stimulus items was by level of difficulty, moving from nouns to verbs to noun-verb phrases, closely matching the hierarchy of levels in the original MIT design described by Sparks (2001).

Table 1

Nouns	Verbs	Phrases
Dinner	Cooking	Cooking dinner
Letters	Mailing	Mailing letters
Carpet	Vacuuming	Vacuum the carpet
Police	Driving	The police are driving
Newspaper	Reading	Reading the newspaper
Leaves	Raking	Rake the leaves
Car	Washing	Wash the car
Bench	Sitting	Sit on the bench
Window	Closing	Close the window
Water	Drinking	Drink water
Door		Open the door
Phone		The phone is ringing
Coffee		Make coffee
Family		The family is visiting
Computer		Using the computer
	Calling	
	Eating	
	Riding	
	Cutting	

The steps for each level are defined in Table 2. Therapy began at level II, presenting 15 nouns. Each noun was sung using one or two notes. If JP failed to express a targeted response during any of the steps, the clinician backed up to the previous step or provided him with a cue. Cues that were given included mouthing the target response, presenting a video clip, or asking JP a question related to the target stimulus item. All nouns were trained at level II until acceptable responses were elicited for each noun with little or no cuing/backing up. The clinician moved on to training verbs and then phrases at level II in the same manner. After JP showed a strong ability to produce target responses at level II during the first two treatment sessions, nouns were trained at level III. When JP consistently produced adequate responses for all nouns, the clinician advanced to training verbs, and then phrases. When JP demonstrated proficiency at level III, the clinician moved on to level IV, intoning each stimulus item using the technique of Sprechgesang.

Table 2

Level II	Step 1: JP and clinician intone in unison	Step 2: Clinician fades	Step 3: JP signaled to repeat after clinician	Step 4: Clinician intones "What did you say?"; JP signaled to respond
Level III	Step 1: Clinician fades	Step 2: JP signaled to repeat with delay of 1-2 seconds	Step 3: Clinician intones a question; JP signaled to respond	
Level IV	Step 1: JP and clinician - Sprechgesang in unison	Step 2: JP signaled to repeat in Sprechgesang with delay of 2-3 seconds	Step 3: JP signaled to respond in normal prosody with delay of 1-2 seconds	Step 4: Clinician asks questions in normal prosody; JP signaled to respond

JP's performance at each level was measured using a system of points shown in Table 3. JP received the full amount of points for each step if he expressed a response that fit closely to the target, without the need for cuing or backing up to the previous step. If the backing-up technique was used once to elicit the target word or phrase for any step, JP received half of the total possible number of points for that step. If backing-up was required more than once, resulting in the failure to elicit the target response, JP received zero points for that step and the clinician moved on to train the next stimulus item. Stimulus items were trained repeatedly through each level until target responses were elicited correctly, without the need for cues, giving JP the total possible number of points for each item.

Table 3

	Step 1	Step 2	Step 3	Step 4	**Total**
Level II	1 pt.	1 pt.	2 pts.	2 pts.	6 pts.
Level III	1 pt.	2 pts.	2 pts.	-	5 pts.
Level IV	2 pts.	2 pts.	2 pts.	2 pts.	8 pts.

Probes

Fifteen verb probes were administered at the start of each session (with the exception of the first) to monitor changes in performance between the beginning and the end of therapy. JP

was shown a short video clip and was asked to express the verb the video was demonstrating. JP was assessed 39 days post-treatment using the same verb probes to examine the stability of the treatment effects.

Results

Treatment

JP was focused and eager to participate in treatment. Often, he was willing to work through each session without taking breaks. He performed well with nouns, verbs, and phrases trained at level II. Very little difficulty was observed during training of nouns and verbs at level III. At level IV, nouns appeared to be the easiest for JP to master, as he consistently received the full amount of points for each item. He also performed well while training verbs at level IV, requiring only two or three back-up steps during a session. At first, phrases trained at levels III and IV required minor cuing (verbal and visual) to elicit target responses. Certain stimuli, including "coffee", "water", "sit on the bench", "open the door", and "rake the leaves" seemed to be easier for JP to produce than other items. Table 4 shows JP's progression through levels and stimuli.

Table 4

Session Number	MIT Level	Stimulus Items
1	II	Nouns, verbs
2	III	Nouns, verbs
3	III	Nouns, verbs, phrases
4	III	Phrases
5	IV	Nouns, verbs, phrases
6	IV	Phrases
7	IV	Phrases
8	IV	Phrases

After conducting the same steps several times, JP was capable of producing correct responses with little or no cuing, and occasionally without the need for some of the proscribed steps. Verbal questions elicited targeted responses with the use of some visual cues, including videos and pictures. JP's comprehension of the stimulus items was closely monitored due to the severity of his condition. He seemed to understand most stimulus items only after repeating them several times while being presented with a video or picture describing each item.

Probes

For the first several probes, JP mostly identified nouns shown in the videos. He was reminded that it was the verb that must be elicited by asking him "what is happening?". Responses tended to vary across sessions. The accuracy of responses for each probe session was calculated using the following formula: ((Total # correct) / Total # stimuli) * 100). A response was considered to be correct if it matched the target word in the present progressive tense or as an infinitive. As seen in Figure 1, JP demonstrated a general trend of improvement in treated stimuli from the first to last probes. Responses to individual stimuli are shown in Table 5.

Figure 1

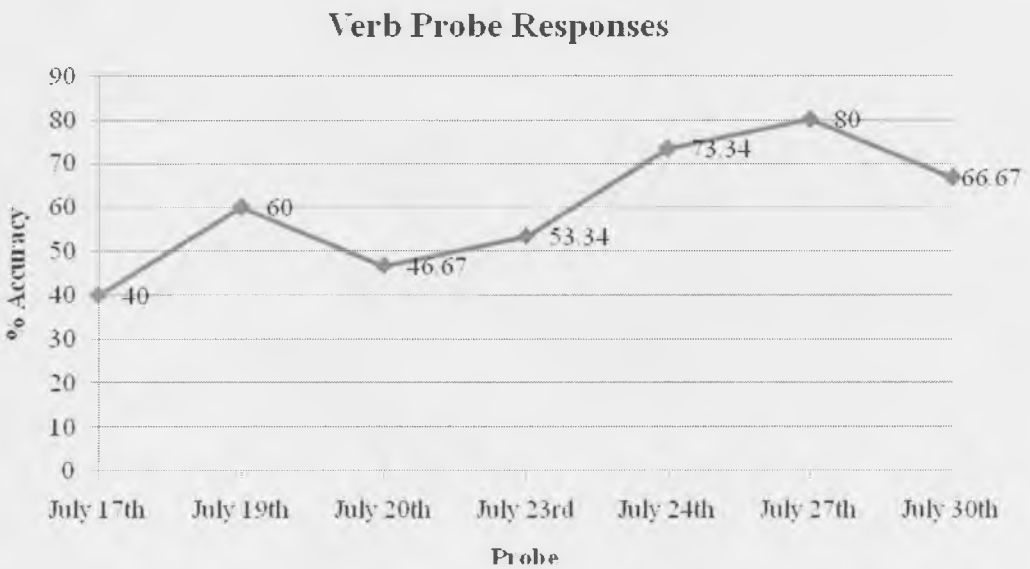

Table 5

Stimulus	Verb Probe 7/17/12 Response	Verb Probe 7/19/12 Response	Verb Probe 7/20/12 Response
Raking	"leaves", "raking"	"raking"	"lake", "leaves"
Cooking	"cooking"	"dinner", "food"	"cooking"
Calling	"phone"	"phone"	"phone"
Riding	"bike"	"bike"	"ride"
Cutting	"cutting"	"cutting"	"cut", "cutting"
Drinking	-	"thirsty"	"cooking"
Reading	"reading"	"reading"	"book"
Driving	"car", "reading"	"car"	"car"
Vacuuming	"vacuuming"	"vacuuming"	"vacuuming"
Washing	"car"	"washing"	"car"
Mailing	"letter"	"mailing"	"mail", "girl"
Eating	"lunch"	"eating"	"sitting", "boy"
Opening	-	"close"	"open"
Sitting	"sitting"	"sitting"	"teacher"
Closing	"cell", "walking"	"closing"	"closing"

Table 5 Cont.

Stimulus	Verb Probe 7/23/12 Response	Verb Probe 7/24/12 Response	Verb Probe 7/27/12 Response	Verb Probe 7/30/12 Response
Raking	"leaves", "rake"	"leaves"	"rake the leaves"	"rake the leaves"
Cooking	"cooking"	"cooking"	"cooking"	-
Calling	"calling"	"work", "calling"	"calling"	"calling"
Riding	"bike"	"bike", "riding"	"bike", "ride"	"riding"
Cutting	"eggs"	"cutting"	"cutting"	"cutting"
Drinking	"cooking"	"drinking"	"ride", "drink"	"drinking"
Reading	"book", "teacher"	"book", "reading"	"read"	"reading"
Driving	"driving"	"car"	"ride", "person"	"driving"
Vacuuming	"vacuum"	"vacuum"	"vacuuming carpet"	-
Washing	"wash"	"wash"	"mailing", "wash"	"washing"
Mailing	"mailman"	"letter", "mailing"	"mailing"	"mail"
Eating	"sitting"	"sitting"	"eating"	-
Opening	"sitting"	"water"	-	"close", "window"
Sitting	"teacher"	"sitting"	-	"teacher"
Closing	"close"	"closing"	"close"	"closing"

Post-Testing

The post-treatment assessment was conducted as part of a larger study with those results to be reported in a separate manuscript. Subjectively, towards the end of treatment, JP's ability to

produce the target nouns, verbs, and phrases had noticeably improved. He seemed to better comprehend each stimulus item during the final level of the hierarchy when responding to questions. His articulation of each item improved as well. During the eighth session, JP was capable of spontaneously producing several phrases. However, the production of many stimuli still required moving through each step of level IV.

Discussion

The purpose of this study was to determine whether a modified version of MIT that trained frequent and highly visual verbs and nouns in structured phrases would be more effective in improving propositional speech in an individual with deficits in comprehension than would a more traditional MIT design that used functional, less visual, and more variable phrases. It was predicted that, with the help of visual cues, increasing the number of common, highly visual phrases would help the patient better comprehend the meaning of each phrase and, accordingly, increase the likelihood of eliciting proper responses.

It was questionable whether or not JP, presenting with weak auditory comprehension skills, would be able to master phrases at each level of the MIT hierarchy. The study demonstrated a general trend of improvement in JP's production of target words between the first and fourth sessions of therapy. During sessions 3 through 8, JP showed possible signs of improvement in both his comprehension and expression for certain tasks, as demonstrated by his accuracy of responses to questions in step 3 of level III and in step 4 of level IV. While performance on certain stimulus items seemed to improve during one session, the improvement did not always generalize to other sessions. It was difficult to predict which words or phrases JP would be able to express easily during any given treatment session. People with aphasia commonly perform inconsistently on linguistic tasks presented in identical contexts, suggesting

that there is an internal, variable function controlling the circumstances under which a task can or cannot be performed (McNeil, Odell, & Tseng, 1991).

The heavy use of visual cues may have contributed to JP's ability to complete therapy. Since he demonstrated poor auditory comprehension, employing videos and pictures corresponding with target words and phrases may have helped to increase his overall understanding of what was asked of him. When asked questions at level IV, without using cues, it was observed that JP knew the correct answers, but he experienced difficulty formulating them. In these cases, it was not the use of visual cues that were needed, but backing up to previous steps of level IV to regain his ability to speak the phrase. He eventually was able to say every stimulus item and respond properly to questions suggesting that it is possible that MIT can be effective for people with severe Broca's aphasia who also have impaired auditory comprehension.

Although a points system was used to keep track of JP's performance, this system was inconsistently applied due to JP's severity. If it was generally agreed upon by the clinicians that any response was adequate, though not verbatim of the target answer, JP did receive the full number of points for that stimulus item. A primary flaw of the study was the absence of baseline data. Without baseline sessions to which experimental therapy sessions could be compared, it is impossible to statistically analyze the results of the study. It was possible, however, to distinguish trends in JP's performance.

Throughout the eight therapy sessions, the clinicians made adjustments in an attempt to make therapy as effective as possible for JP. Such adjustments included the addition or removal of visual cues, skipping mastered stimuli, and re-training words and phrases that were more difficult for JP. He was classified as having Broca's aphasia, but due to the severity of his

condition, it was not guaranteed that he would be able to master every stimulus item. It was important to structure therapy around the personal needs of the participant to ensure the study's success. Since there can be innumerable differences between individuals with aphasia, it is impossible to design a therapy program that will be effective for every patient. A proscribed treatment method should be evaluated for ways it can be modified to best fit an individual's needs and abilities.

Overall, the results of this study suggest that modifying the traditional MIT design may be useful for administering therapy to individuals with impaired comprehension. The original MIT program was not designed for people with impaired comprehension. The findings of this study show that people with severe aphasia can benefit from MIT when using visual tools to compensate for their lack of auditory comprehension. Instead of disqualifying patients who do not fit the eligibility requirements for therapy, clinicians can look for ways to modify treatment to accommodate them.

References

Conklyn, D., Novak, E., Boissy, A., Bethoux, F. and Chemali, K. (2012). The Effects of Modified Melodic Intonation Therapy on Nonfluent Aphasia: A Pilot Study. *Journal of Speech, Language and Hearing Research,* 55, 1463-1471.

Hough, M. (2010). Melodic Intonation Therapy and Aphasia: Another Variation on a Theme. *Aphasiology,* 24, 775-786.

Long, S. (2008). MaUSECat: Marquette University Spanish English Catalog [Software]. Available from http://computerizedprofiling.org/MaUSECat/index.php

McNeil, Odell, & Tseng (1991). Toward the Integration of Resource Allocation into a General Theory of Aphasia. *Clinical Aphasiology*, 20, 21–39.

Schlaug, G., Marchina, S., & Norton, A. (2008). From Singing to Speaking: Why Singing May Lead to Recovery of Expressive Language Function in Patients with Broca's Aphasia. *Music Perception,* 25, 315-323.

Schlaug G., Norton, A.C., Marchina, S., Zipse, L., & Wan, C.Y. (2010). From Singing to Speaking: Facilitating Recovery From Nonfluent Aphasia. *Future Neurology,* 5, 657-665.

Sparks, R. W. (2001). Melodic Intonation Therapy. In Chapey, R. (Ed.) *Language Intervention Strategies in Aphasia and Related Neurogenic Communication Disorders*. Philadelphia: Lippincott Williams and Wilkins.

Vines, B.W., Cornell, Norton, A.C., & Schlaug G. (2011). Non-Invasive Brain Stimulation Enhances the Effects of Melodic Intonation Therapy. *Frontiers in Psychology: Auditory Cognitive Neuroscience,* 2, 1-10.

Wan, C.Y., Rüber, C., Hohmann, A., & Schlaug, G. (2010). The Therapeutic Effects of Singing in Neurological Disorders. *Music Perception,* 27, 287-295.