

Melodic Intonation Therapy with Young Children with Apraxia

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A practice-based review of available research indicated that there is little to no evidence available supporting the effectiveness of Melodic Intonation Therapy (MIT) for children with apraxia. MIT is characterized by short intoned phrases presented in a step-by-step progression until a child is eventually able to respond to a question in normal speech. Only three published studies were located that included information on the characteristics and consequences of the practice. The six participants in these three studies received an individualized form of the MIT procedure. A number of procedural and methodological problems make it difficult to claim linkages between the characteristics of MIT and the outcomes reported in the studies.

Purpose

The purpose of this practice-based research synthesis is to ascertain the effectiveness of melodic intonation therapy (MIT) for increasing the verbal communication abilities of children with developmental apraxia of speech (DAS). DAS is “a neurological impairment of speech resulting in an impaired ability to carry out purposeful movements of the articulators in the absence of motor or sensory paralysis” (Ferry, Hall, & Hicks, 1975). The conduct of this practice-based research synthesis is guided by a framework that focuses on the extent to which variations in practice characteristics are related to variations in outcomes (Dunst, Trivette, & Cutspec, 2002).

MIT was developed primarily for use with children and adults with aphasia (Albert, Sparks, & Helm, 1973). Although limited, there is some evidence that the practice is effective for treating the speech-related problems of both populations when diagnosed with Brocca’s aphasia (Naeser & Helm-Estabrooks, 1985). However, the technique is now being frequently used with children diagnosed with developmental apraxia of speech (Crary, 1993). Websites (Childhood Apraxia of Speech Association, 2002), trainings (UCLID Center, 1997) and college curricula (Byrne, 2003; McCaffrey, 2001) all recommend the use of MIT with children with apraxia. The claims about the benefits of the practice with young children with this disorder have yet to be established.

Background

Melodic intonation therapy was originally designed for use with adults who suffered from severe aphasia as a

result of a stroke. It was a way for them to regain the ability to encode thoughts into units of functional verbal communication (Sparks & Holland, 1976). The emphasis of intervention for these patients was the recovery of propositional language rather than the motor aspects of speech production. MIT is based on a physiological model of brain functioning that specified right hemispheric dominance for music and speech prosody (Sparks & Holland, 1976).

Description of the Practice

The selection criteria for adult aphasia patients considered to be the best candidates for MIT include: (a) no evidence of bilateral brain damage, (b) average-to-high receptive abilities, (c) poor repetition of single words, (d) non-fluent verbal production with inadequate articulation agility and effortful initiation of verbal communication, and (e) a well motivated, emotionally stable patient with an appropriate attention span (Benson, Dobkin, Rothi, Helm-Estabrooks, & Kertesz, 1994). Most children diagnosed with DAS, as a primary or secondary condition, have many of these same characteristics (Helfrich-Miller, 1994).

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Adult version. The adult version of MIT is divided into four levels (Sparks & Holland, 1976). Level I consists only of the clinician humming intoned phrases and the client handtapping the rhythm and stress of each pattern. The steps in Level II progress from requiring the client to tap the rhythm and stress of the clinician's humming to repeating an intoned phrase or sentence. At Level III, response difficulty is increased by fading the participation of the clinician, introducing a delay of responses so that some element of retrieval is brought in, and requiring appropriate client responses to intoned questions. A backup procedure is also introduced in this level to allow the client an opportunity to correct errors. Level IV, the final level of MIT, focuses on a return to normal speech. At this level, the sentences used as part of implementing the process are longer and more complex. During the last steps, the transition back to normal speech is facilitated by a process called *sprechgesang* (speech song). This technique involves keeping the same melodic line as the intoned sentence of the preceding step, except that the constant pitch of the intoned words is replaced by the variable pitch of speech.

Child version. Since most children diagnosed with apraxia of speech have some of the same characteristics that are used to determine adult candidacy for the use of MIT, clinicians began to use MIT procedures (eventually in a modified form) with their pediatric clients. Due to the high level of structure and rigor in the original form of MIT, clinicians found that it could not be implemented with all children as prescribed, which necessitated modifications in the procedure. The modified version of MIT consists of three levels, each including either five or six steps organized from the least to the most difficult (Helfrich-Miller, 1994). The pediatric version does not include Level I of the adult version and uses signing instead of handtapping for the motoric supplemental component. The procedure includes individual modifications as necessary. Level I provides maximum supports to the child. All target phrases are simultaneously intoned and signed by the clinician using Signed English. Level I begins with the clinician intoning and signing a simple phrase with no expectation of participation from the child (step 1) and progresses until the child responds by intoning and signing the last words of an intoned question (step 6). Level II is much the same as Level I, but adds processing time of at least six seconds, where participation of the clinician fades with each step. The Level III procedure promotes normal child speech using the same transitional step as the adult version (*sprechgesang*). Processing time and back-up procedures to correct errors are used throughout this level. The use of signing is faded out and the last two steps involve questioning, using normal speech. Individual modifications such as visual or physical stimulus are used on an as needed basis.

Search Strategy

Search Terms

Studies were initially identified using Melodic Intonation Therapy and music therapy as search terms. An author search was also conducted using Sparks and Holland as search terms. The search was further refined by using children and apraxia as a restrictor.

Sources

The American Speech and Hearing Association (ASHA) database, the Educational Resources Information Center (ERIC) database, PsycINFO, and MEDLINE were the primary databases searched for locating relevant studies. Other studies were located using the reference lists of studies found after conducting the initial searches.

Selection Criteria

Studies were included in the review if they used the MIT procedure with children identified with apraxia of speech, or if the study described a child's speech deficit in a way that it could be inferred that the child had apraxia. Only three studies were located that described the effects of MIT with children with apraxia. Several unpublished studies (Doszak, McNeill, & Jancosek, 1981; Helfrich-Miller, 1980) presented at national conferences or referenced in published studies (Helfrich-Miller, 1994) were requested from the authors but were not provided. The information that was available on these unpublished studies was too incomplete to include in this synthesis.

Search Results

Table 1 summarizes available information about the study participants and the selected characteristics of the MIT intervention used with each child. The measures used to determine child progress are also listed in the table.

Participants

The three studies included only six children. The ages ranged from 33 to 96 months in the studies reporting child age. Five of the children were diagnosed with apraxia of speech, and the one child with autism had a suspected secondary diagnosis of apraxia.

Practice

The length of time MIT was implemented for each child ranged from 2 to 33 months (see Table 1). The frequency of sessions ranged from once a week to three times a week. In all cases, the MIT condition consisted of multiple sessions implemented over an extended period of time.

Table 2 summarizes the available information regarding each child's treatment protocol in terms of the levels of the procedure completed. The three participants in the Helfrich-Miller (1994) study were the only children who completed all levels. The children in the Krauss and Gallo-

way (1982) study completed the first two levels of the adult version of MIT. Insufficient information was provided by Miller and Toca (1979) to determine the levels completed by the child in this study.

Close inspection of the research reports found that several modifications were made in the studies using the pediatric version of MIT. For example, if a child did not respond to Signed English as a physical prompt, Miller and Toca (1979) used a visual (picture) stimulus and hand-over-hand manipulation as a substitute for this component of the practice.

Outcomes

The behaviors targeted as the benefits of the MIT practices were an increased amount and complexity of verbal output and an increased intelligibility of verbal output. Sometimes this information was explicitly stated in terms of the outcomes measures that were used, and other times this was inferred from the descriptions of change provided in the text. The Porch Index of Communicative Ability in Children (Porch, 1974) and the Language Sampling, Analysis, and Training Procedure (Tyack & Gottsleben, 1974) were used in one study to measure speech and language outcomes, and the Goldman-Fristoe Test of Articulation (Goldman & Fristoe, 1986) was used in another study. No specific instruments were reported for the third study.

Research Designs

All three studies used some type of pre-experimental, single-participant, case report design (Barlow & Hersen, 1984; Campbell & Stanley, 1963). The designs are depicted on Table 3, where O represents an observation, description, or measurement of language behavior; Y represents traditional speech and language therapy; X represents the implementation of MIT; and the subscripted numbers represent the MIT levels. Each study included at least one intervention in addition to MIT.

Synthesis Findings

Table 3 summarizes the major findings reported by the investigators. The table also includes the major threats to the authors' claims about the effectiveness of the MIT. Despite the fact that the investigators reported positive effects for MIT, a number of procedural and methodological problems make claims about the effectiveness of the procedure equivocal and open to alternative explanations.

Sample Sizes

The fact that only three studies have been conducted, and that the studies included only six children, raises questions about the adequacy of the evidence substantiating the effectiveness of MIT with children with apraxia. Even in the absence of the other problems described below, too

few studies with too few study participants indicates that too little evidence is available about the effectiveness of the practice.

Treatment Fidelity

The extent to which MIT was implemented as described was not established in any study. Nor was any measure obtained of the extent to which different study participants experienced similar or dissimilar features or aspects of MIT (Helfrich-Miller, 1994; Krauss & Galloway, 1982). In one study, insufficient information was provided even to establish the levels of MIT administered and completed (Miller & Toca, 1979).

Dose-Response Effects

The investigators of all three studies reported decreased articulation errors and increased intelligibility for targets phrases. Percentage of increased intelligibility reported ranged from 20% to 50%. Significant differences were reported for confrontational naming for two participants, and for verbal imitation tasks for one participant (Krauss & Galloway, 1982). Another study reported more spontaneous words and longer mean length of utterances (Miller & Toca, 1979). But the amount of change reported (response) in relationship to the amount of intervention provided (dose) is so small that the effectiveness of MIT must be considered equivocal at best. Because the length of intervention in two studies was so long (12 to 33 months), events other than MIT could have occurred to influence reported changes (history). Furthermore, the time interval between measurement occurrence was of sufficient duration that biological and maturational changes could easily have manifested themselves. These alternative explanations loom large because neither the research designs nor other controls were used that ruled out alternative explanations.

Statistical Conclusion Validity

Despite the fact that Krauss and Galloway (1982) reported statistical differences for observed change, any number of threats to statistical validity (Cook & Campbell, 1979) are present that raise questions about the authors' conclusions. The two most important are violations of the assumptions of the statistical tests used to discern change, and the lack of use of the appropriate data analysis design procedures for establishing differences between observation and measurement of change.

Multiple Treatment Interference

In addition to internal validity threats, multiple treatment interference may have occurred in two studies (Krauss & Galloway, 1982; Miller & Toca, 1979). In both investigations, the influences of or contributions to variations or modifications introduced (but never documented) may have accounted for observed changes rather than MIT.

Conclusion

The small number of studies, small number of participants, lack of treatment fidelity measures, possible threats to external and internal validity, and individual modifications that were made in the MIT procedures, all converge on the fact that the empirical evidence to support Melodic Intonation Therapy with children with apraxia is meager at best. Consequently, the use of MIT is not warranted as an evidence-based practice, because the research that is available is inconclusive regarding its effectiveness to produce hypothesized benefits.

The fact that speech and song are inextricably linked (Cohen, 1994) and that research evidence exists about the role of song and music in early childhood competence development (see e.g., Custodero & Fenichel, 2002; Standley, 2001), shows there are elements of MIT that appear to hold promise as an effective intervention practice. What are needed, however, are better designed and implemented studies of MIT, or the evaluation of specific components of the practice, to identify those elements that are and are not necessary for song-facilitated speech development to be effective. What is especially needed is research that documents the experiences afforded MIT recipients, and relates variations in these experiences to differences in outcomes. This type of process-outcome analysis cannot but be helpful in informing practice to the extent that the characteristics of the practice that are functionally related to desired behavior consequences are made as explicit as possible.

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Table 1
Selected Characteristics of the Study Participants

| Study | P ^a | Child Age (Months) | Gender | Child Diagnosis | Sessions per MIT Level | | | |
|--|-----------------------------------|--------------------|--------|---|------------------------|---------|---------|--|
| | | | | | Level 1 | Level 2 | Level 3 | |
| Helfrich-Miller (1994) | 1 | 33 | Male | Apraxia of speech | 17 | 16 | 14 | |
| | (Two times per week for one year) | | | | | | | |
| | 2 | 34 | Male | NR ^b , Implied Apraxia of speech | 31 | 24 | 16 | |
| (One time per week for two years, nine months) | | | | | | | | |
| Krauss & Galloway (1982) | 4 | NR | Male | Apraxia of speech | NR | NR | 0 | |
| | (Two months) | | | | | | | |
| | 5 | NR | Male | Apraxia of speech | NR | NR | 0 | |
| (Two months) | | | | | | | | |
| Miller & Toca (1979) | 6 | 38 | Male | Autism | NR | NR | NR | |
| (33 total sessions) | | | | | | | | |

^aP = Participant.

^bNR = Not Reported.

Table 2
Research Design, Outcome Measures, and Participant Exposure to the Pediatric Version of Melodic Intonation Therapy

| Study | P ^a | Research Design ^b | Outcome Measures | Modified Levels of Melodic Intonation Therapy ^c | | | |
|--------------------------|----------------|---|--|--|---------|---------|---------|
| | | | | Level 0 | Level 1 | Level 2 | Level 3 |
| Helfrich-Miller (1994) | 1 | OX ₁ OX ₂ OX ₃ O | Goldman & Fristoe (1986) Test of Articulation | NA | Yes | Yes | Yes |
| | 2 | OX ₁ OX ₂ OX ₃ O | Not Reported | NA | Yes | Yes | Yes |
| | 3 | OX ₁ OX ₂ OX ₃ O | Goldman & Fristoe (1986) Test of Articulation | NA | Yes | Yes | Yes |
| Krauss & Galloway (1982) | 4 | OYOXYO | Porch (1974) Index of Communicative Ability Tyack & Gottsleben (1974) Language Sampling, Analysis, and Training | Yes | Yes | No | No |
| | 5 | OYOXYO | Porch (1974) Index of Communicative Ability Tyack & Gottsleben (1974) Language Sampling, Analysis, and Training | Yes | Yes | No | No |
| Miller & Toca (1979) | 6 | YOXO | Not Reported | NA | II | II | II |

^aP = Participant

^bAll three studies used pre-experimental, single-participant case reports (Barlow & Hensen, 1984; Campbell & Stanley, 1963). O = Observation, description, or measurement of language behavior; X = MIT; Y = Traditional speech and language therapy; and subscripted numbers = MIT levels.

^cLevel 0 is equivalent to Level 1 of the adult version of the MIT (Sparks & Holland, 1976). NA = Not Applicable, Yes = Level included as part of the protocol, No = Level not included as part of the protocol or the treatment was ended before the level was achieved, and II = Insufficient information provided to determine the level of participation.

Table 3
Major Findings and Threats to Claims About the Effectiveness of Melodic Intonation Therapy

| Study | P ^a | Major Findings | Major Alternative Explanations ^b |
|--------------------------|----------------|--|---|
| Helfrich-Miller (1994) | 1 | Participant had acquired all sounds except <i>r</i> , <i>l</i> , and the voiceless <i>th</i> . Initially he produced correctly only three sounds in three positions of words after one year of therapy. His conversational skills were within normal limits, and at age 11 his speech and language measured within normal limits. | Maturation/History |
| | 2 | Errors continued with the sounds <i>l</i> , <i>r</i> , <i>s</i> , <i>z</i> at the end of a 2.75-year course of MIT. Complex sentences were being used, however, intelligibility decreased in connected speech. | Maturation/History |
| | 3 | A reduction in sequencing error rate from 75% to 22% for the same 10 sentences. A substantial reduction in the rate of speech and numerous self corrections were noted. Errors continued on sounds <i>l</i> , <i>r</i> , <i>v</i> , and voiced and voiceless <i>th</i> . | Maturation/History |
| Krauss & Galloway (1982) | 4 | Significant differences between pretest 2 and the posttest were noted for the verbal (confrontational) naming task at the .01 level for individual scores and at the .005 level for combined scores. Both verbal imitation tasks were significant at the .05 level when combined, and for this participant individually. Word-morpheme performance level increased from pretest 2 to posttest. ($p < .02$). Intelligibility increased from 40% to 90%. | Multiple treatment interference Testing Statistical conclusion validity |
| | 5 | Significant differences between pretest 2 and posttest were noted for the verbal (confrontational) naming task at the .03 level for individual scores and at the .005 level for combined scores. Both verbal imitation tasks were significant at the .05 level when combined. Word-morpheme performance level increased from pretest 2 to posttest. ($p < .005$). Intelligibility improved from 30% to 50%. | Multiple treatment interference Testing Statistical conclusion validity |
| Miller & Toca (1979) | 6 | Child was able to produce a two-word phrase (more + food item) after 35 sessions. New spontaneous words appeared randomly across situations, and the child's mother reported increased interest in his family and a new emotion of disappointment when he did not get what he wanted. | Multiple treatment interference History |

^aParticipant.

^bCook and Campbell (1979).