Critical Review:
Melodic Intonation Therapy: The Influence of Pitch and Rhythm on Therapy Outcomes

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Melodic Intonation Therapy (MIT) involves involves patients with nonfluent aphasia intoning (singing) melodic phrases while tapping syllables. Thus, MIT incorporates the musical components of both pitch and rhythm. This critical review explores the relative contribution of the rhythmic and pitch components of MIT to determine if both components are required for success. To explore this question, articles were found that compare therapy involving (1) pitch and rhythm components, (2) just rhythmic components, and (3) neither of these musical components. Results suggest that there is no benefit of pitch (singing) when training a set of phrases. However, pitch may be important for long-term retention of those phrases as well as generalization to non-trained phrases and connected speech.

Introduction

Aphasia is an acquired loss or impairment in communication following brain damage, usually in the left hemisphere. Patients with Broca's aphasia (nonfluent aphasia) have difficulty producing grammatical sentences. For more than 100 years, it has been reported that patients with severe nonfluent aphasia are better at singing lyrics than they are at speaking the same words. This observation led to the development of Melodic Intonation Therapy (MIT), which involves patients intoning (singing) melodic phrases while tapping syllables. It is designed to lead patients from singing 2–3 syllable phrases, to speaking phrases of 5 or more syllables across three levels of treatment. Phrases are intoned on two pitches, "melodies" are determined by the phrases' natural prosody, and the patient's left hand is tapped for every syllable (Norton et al., 2009). Thus, MIT incorporates the musical components of both pitch and rhythm.

Schlaug et al. (2008) compared MIT with a control treatment that differed only by the removal of pitch and rhythmic components. The study only had two patients, both of which had been diagnosed with severe nonfluent (Broca's) aphasia as a result of a left hemisphere ischemic stroke. MIT led to greater improvement than the non-musical treatment on generalization to connected speech. Thus, the melodic characteristics of MIT (pitch and rhythm) seem to play a role in MIT's effectiveness.

MIT follows a very specific protocol, and not all patients may be comfortable with the singing component of this therapy. The current review explores the relative contribution of the rhythmic and pitch components of MIT to determine if both components are required for success, and why the incorporation of pitch, rhythm, or both leads to more benefits than speech therapy without these musical components. To explore this question, the current review includes articles that compare therapy involving (1) pitch and rhythm components, (2) just rhythmic components, and (3) neither of these musical components.

Objectives

The current review explores the contribution of the rhythmic and pitch components of MIT to determine if both components are required for success.

Methods

Search Strategy

A variety of computerized databases including PubMed and Psych Info were searched using the following terms:

(Melodic Intonation Therapy) OR (MIT) AND (rhythm) OR (pitch) or (melody)

Selection Criteria

Studies selected for inclusion in this review were required to investigate Melodic Intonation Therapy and the respective contribution of melodic intonation (pitch) versus rhythm or both elements compared to speech ttreatments that exclude these elements. There were no limits set on the demographics of the research participants or outcome measures.

Data Collection

Three articles were found consisting of: 1 non-randomized control study, 1 case study, and 1 crossover design study.

Results

Nonrandomized Control Study

Stahl et al. (2013) conducted a nonrandomized control study. A total of 15 patients with chronic non-fluent aphasia were systematically assigned to one of three different treatment groups based on the following criteria: clinical diagnosis (Broca's or global aphasia) (each treatment group had 2 patients with Broca's aphasia), severity of affiliated apraxia of speech, age, and gender. None of the patients had any previous musical training or experience in singing. The researchers compared the production of 15 sentences in the following three treatment groups: ***(1) Singing therapy (pitch + rhythm)***, which involved intense training of the sentences by singing them to a well-known melody, ***(2) Rhythmic therapy (rhythm only)*** which involved training using the same lyrics, but rhythmically speaking the sentences with natural prosody instead of singing them, and ***(3) Standard therapy (control group, no pitch or rhythm)*** which involved speech therapy that did not include singing or rhythmic speech. Data was collected before treatment and after 6 weeks of treatment. Two speech-language pathology students (who were naive to the experiment) independently rated the articulatory quality (percentage of correct syllables) of the produced sentences based on digital sound files, with two raters for each patient. In addition to assessing performance on the 15 sentences trained sentences, performance on untrained sentences was also assessed.

The scores from the two students were averaged for each patient, and appropriate statistical analyses were performed to analyze pre and post treatment data. Results showed strong improvements in the production of the sentences for patients in the singing therapy and rhythmic therapy groups, and effects were stable over three months. The standard therapy group only showed a small increase in performance. Most importantly, no significant difference appeared at the group level between the singing group and rhythm group after the treatment or at three-month follow-up. Based on these findings, it was inferred that pitch variation did not add any clinical effect over rhythm. In addition, participants in the singing therapy and rhythmic therapy did not out-perform those who underwent standard speech therapy, suggesting the musical components had no impact on generalization to untrained stimuli.

Although there were only five patients in each treatment group, the researchers ensured that the groups were comparable. All aspects of the study (including stimuli selection, patient selection, methods, and data analysis) were well thought out, well documented, and appropriate. Overall, this study provides compelling evidence that rhythm is the key musical element responsible for success of Melodic Intonation Therapy for patients with non-fluent aphasia, and that singing does not offer any additional benefit.

Case Study

Wilson, Pearsons, and Reutens (2006) completed a case study with a patient who was an experienced musician with chronic severe Broca's aphasia. The patient was trained on 3 lists of 10 words, each list in one of three experimental conditions including: *(1)* ***classical melodic intonation and tapping training (therapist intones phrase and taps rhythm),*** *(2)* ***rhythmic training only with no pitch variation (therapist recites phrase and taps rhythm)****, and (3)* ***no training (control)***. The training conditions involved biweekly practice sessions for four weeks under the guidance of a Registered Music Therapist. The immediate and longer-term effects of the different treatment conditions were compared by assessing the patient's production of the trained stimuli at baseline, one week, and five weeks after therapy.

Appropriate analyses were completed to compare his performance on trained sentences after one week of intervention, and five weeks after the end of therapy. One week after intervention, the participant showed significant improvement in recall and production of the two sets of trained sentences (rhythm+ pitch and rhythm only) compared to the control list, with no significant difference between the two training conditions. Five weeks after the end of therapy, a stronger effect of melodic intonation and rhythm was found. According to the authors, therapy that involves singing may promote more efficient memory storage or access to the trained phrases.

Given that this study only had one patient, it is difficult to use it to make clinical recommendations. Furthermore, the patient was an experienced musician. This makes it difficult to generalize the findings to a larger clinical population that may consist of non-musicians. Another limitation was that this study did not make a comparison to a control treatment condition (standard speech therapy). Thus, it is difficult to conclude how effective either of the treatment conditions in this study would be for this patient compared to standard speech training without musical elements. Finally, only performance on the trained phrases was assessed, thus offering no information regarding generalization.

Overall, this study provides suggestive evidence that rhythm-only therapy and melodic therapy (pitch + rhythm) can provide equally effective short-term improvements on trained stimuli, suggesting that rhythm is the key element for short-term success.

However, the study also provides suggestive evidence that both rhythm and pitch may be key elements for longer-term success on trained stimuli.

Crossover Design Study

Zumbansen, Peretz, and Hébert (2014) conducted a 6-week crossover design study with three patients with chronic Broca's aphasia. The study assessed the relative contributions of rhythm and pitch to post-treatment performance on trained stimuli, generalization to untrained stimuli, as well as connected speech. The researchers randomly assigned patients to a treatment sequence (of three treatments) using an objective method. The three treatments included (1) ***melodic therapy (pitch + rhythm)***, (2) ***rhythmic therapy (rhythm only)*** and (3) ***normally spoken therapy (without melodic elements).*** Each treatment was administered by a trained Speech-Language Pathology graduate student, with three one-hour sessions per week for six weeks. To assess treatment outcomes, patients were assessed on percent correct syllables on trained phrases, non-trained phrases, and discourse informativeness (in percent correct information units) of connected speech using a picture description task. Assessments were completed before and after each treatment condition.

Appropriate Wilcoxon signed-rank analyses were completed to compare pre and post treatment scores for each patient and each condition. The melodic therapy (pitch + rhythm) had the strongest generalization effect to non-trained stimuli as well as connected speech. For trained stimuli, both the melodic therapy (pitch + rhythm) and rhythmic therapy (rhythm only) led to improvements in speech accuracy. This suggests that the incorporation of pitch offered no advantage over the rhythm-only therapy for performance on trained stimuli.

This study has many strengths, including the consideration of generalization to connected speech. Limitations included not exploring longer-term effects of treatment as investigated in the two previous articles. In addition, this study failed to mention whether any of its participants had prior musical training, whereas the two previous articles clearly stated these details. For trained stimuli, the study provides compelling evidence that rhythm is the key musical element responsible for success. For generalization to untrained stimuli and connected speech, this study provides compelling evidence that the combination of both pitch and rhythm are key elements responsible for success.

Discussion

The three articles reviewed were very different from each other in terms of sample sizes, study design, and methodology. However, they each tackled the very specific question under investigation, which was whether pitch and rhythm both contribute to success in Melodic Intonation Therapy.

For improvements on trained phrases, all three articles demonstrated no significant difference between phrases trained with rhythm and pitch components versus just a rhythmic component. This suggests that when learning phrases, the incorporation of pitch (singing) offers no added benefit to post-treatment performance on those phrases.

For long term retention of those trained phrases, Wilson, Pearsons, and Reutens (2006) showed the best performance on phrases trained with both rhythm and pitch, suggesting the involvement of singing may be important for long-term retention of trained stimuli. However, Stahl et al. (2013) did not support this finding, as participants did equally well on trained phrases whether trained in the rhythm and pitch condition or rhythm only condition. Thus, the two articles that addressed long-term success have conflicting results. However, it may be worth noting that the participants in these two studies differed in their level of musical experience. That is, the participants from Stahl et al.'s article all had no musical experience and showed no benefit from singing, whereas the participant in Wilson et al.'s article had extensive musical experience and did demonstrate a benefit of singing. This observation suggests that previous musical experience and training may impact the effectiveness of MIT on speech outcomes. That is, it is possible that individuals with extensive musical training may benefit more from the incorporation of these musical components than individuals without musical training. Unfortunately the third article (Zumbansen, Peretz, and Hébert (2014)) did not comment on the musical backgrounds of their participants.

For generalization to untrained phrases, Stahl et al. found no benefit of pitch and rhythm or just rhythm compared to standard therapy, whereas Zumbansen found treatment involving both pitch and rhythm led to the best performance on untrained phrases. Thus, there is conflicting evidence on this outcome measure.

Finally, Zumbansen, Peretz, and Hébert (2014) were the only ones to investigate generalization to connected speech, which is the primary goal of MIT. They found that therapy that incorporated both pitch and rhythm led to the best therapy outcomes on connected speech. This suggests that the singing component of MIT may play a role in generalization. Future studies should continue to include this variable, as generalization to untrained

speech is arguably one of the most important speech therapy outcomes.

Conclusion

For short-term improvement on trained phrases, all three articles suggest that pitch offers no added benefit beyond rhythm. However, pitch may be important for: long-term retention of trained phrases (Wilson, Pearsons, and Reutens (2006)), generalization to non-trained phrases (although Stahl et al. (2013) found no effect of rhythm and pitch on generalization to non-trained phrases), and generalization to connected speech (Zumbansen, Peretz, and Hébert, S. (2014)). Future research should aim to increase sample sizes and further investigate the impact of singing on generalization to connected speech. In addition, future research should consider further exploring the impact of previous musical training on MIT effectiveness.

Clinical Implications

Given that there has not been very much research on this particular question and that the conclusions are not very strong, it is difficult to draw any strong clinical implications. However, the results of this critical review suggest that rhythm definitely plays an important role in the success of MIT, and that pitch might play an important role in long term retention of trained phrases and to generalization. MIT should therefore continue to be administered with its standard protocol. However, given that there is evidence to suggest that rhythmic therapy can be just as effective when the goal is to train patients on a specific set of phrases, a modified version of MIT that maintains the rhythmic components but eliminates the singing aspect could be considered. The consideration of this modification could be useful for patients who are resistant to the singing aspect of MIT (ie., those who feel uncomfortable singing in therapy may be happier with rhythmic therapy and still experience the same success).

References

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