

**Critical Review:**  
**In individuals with neurogenic communication disorders, does incorporating musical elements into speech and language treatment improve outcomes over traditional intervention?**

Jessica S.K. Chan  
M.Cl.Sc SLP Candidate  
Western University: School of Communication Sciences and Disorders

Incorporating musical elements into traditional speech and language intervention has been of interest given the potential overlap in the cognitive processing of music and language. This critical review examined the relevant evidence, and included six articles. Study designs included case studies, a survey, mixed group, case series, and a systematic review. Overall, the evidence of this review provided suggestive evidence that incorporating musical elements into speech and language treatment improves outcomes over traditional intervention alone in individuals with neurogenic communication disorders. Recommendations for clinical practice and future research are discussed.

***Introduction***

Neurogenic communication disorders include various forms of language disorders, including aphasia, and neurogenic motor speech disorders, including apraxia of speech and dysarthria. As such, these individuals comprise of a very heterogeneous population; the communication disorders can occur in isolation with multiple impairments (King 2007). The characteristics usually seen in language disorders include impairments in speaking, comprehension, reading, and writing; and in motor speech disorders impairments in articulation, phonation, prosody, resonance, and possibly respiration (Hobson 2006).

One reason that musical elements may be beneficial to include in traditional speech and language therapy is that evidence suggests an overlap in neural systems and operations supporting language and music processing. Indeed, there are recognized similarities in language and musical systems such as in the hierarchical rules constraining musical and linguistic syntax (Hurkmans et al., 2015; but see Hobson, 2006).

One particularly widely known therapeutic technique that incorporates the use of musical elements is Melodic Intonation Therapy (MIT) (Kennelly, Hamilton, Cross 2001). MIT is a method that is mainly used with patients specifically with aphasia. The technique is based on turning common words and phrases into melodic phrases emulating typical speech intonation and rhythmic patterns, therefore, the musical elements used are to promote intonation and rhythm. However, this technique uses restricted musical elements (Hurkmans et al. 2015), so it may not optimize the benefits of incorporating musical elements. In addition, experiments have only used small sample sizes and do not give strong evidence of effectiveness (Hurkmans et al. 2015). The critical analyses included in this review did not focus on MIT, rather, the effectiveness of other musical elements is explored.

***Objectives***

The primary objective of this paper was to review and critically evaluate the existing literature regarding whether incorporating musical elements into speech and language intervention would produce better treatment outcomes over traditional intervention. The second objective was to provide speech-language pathologists with evidence-based recommendations for clinical practice and future research.

## *Methods*

### Search Strategy

Computerized databases, including ProQuest, Gale Virtual Reference Library, Scholars Portal, Directory of Open Access Journals were searched using the following terms:

[(speech music therapy) OR (speech language pathology) AND (music therapy)] AND [(acquired brain injury) or (brain injury) AND (communication disorder)]

### Selection Criteria

Studies selected for inclusion in this critical review were required to investigate treatment techniques that used any types of musical elements with patients who have had acquired brain injury, and informational studies that discussed inclusion of music in traditional speech and language treatment. There were no limits set on the demographics of the research participants or outcome measures.

### Data Collection

Results of this literature search yielded eight articles congruent with the aforementioned selection criteria. The studies involved the following designs: qualitative studies (2), survey (1), mixed group (1), case series (1), systematic review (1), and case studies (2).

## *Results*

### Case Studies

Information presented in case studies are often useful and provide beneficial implications on future research in heterogeneous populations such as neurogenic communication disorders. Their generalization may be limited given the focus on individual cases.

**Kennelly et al. (2001)** conducted a case study to investigate if including musical elements into speech and language therapy will improve outcomes in two paediatric individuals who suffered from motor vehicle accidents and presented with neurogenic communication disorders. Intervention procedures (e.g. breath control, singing familiar songs, etc.) were described briefly, and were individualized based on the participant goals. However, the schedule details of treatment were not reported, which make it not sufficient for replication. The authors reported increase in intelligibility, prosody, and pitch range in speech; and improvements in making choices and following directions using anecdotal evidence given by the clinicians, parent reports, and qualitative descriptors only. Statistical analysis was not presented.

The different methods and outcome measures employed across participants limits the ability to draw conclusions across cases.

Overall, this study provides somewhat suggestive evidence that incorporating musical elements in speech and language therapy for individuals with neurogenic communication disorders can be beneficial.

**Leung (2008)** conducted a case study with an 11-year-old male presenting with injuries to the head and neck including cranial nerve palsies that resulted in dysarthria and dysphagia. Intervention was described in detail including goals, and schedules, and specifically aural motor coordination, speech production, and breath control by encouraging playing rhythmic patterns on a drum and then vocalizing the same pattern with speech sounds. A well-recognized assessment of dysarthria was administered post-treatment, however, the patient's baseline scores were not reported. A written questionnaire was completed by the patient and mother at post-treatment. It was concluded that this therapeutic combination offered an interactive and engaging program that improved outcomes in his tongue control and speech production.

Overall, this study provides somewhat suggestive evidence of the benefits of incorporating musical elements in speech therapy for individual with neurogenic communication disorders.

### Survey

**McCarthy et al (2008)** conducted a survey to ask about the work and experiences of 847 SLPs and music therapists working together using augmentative and alternative communication with their clients with speech and language impairments.

The objectives were clearly stated. Details regarding the individuals invited to participate and the rate of responses were provided. Results were described in terms of proportions of participants agreeing, and descriptions of written responses. Responses indicated that not all SLPs are familiar with musical inclusion for AAC, and not all music therapists are familiar with AAC.

Overall, this study provides equivocal evidence of whether incorporating musical elements into traditional speech and language therapy is beneficial.

### Mixed Group

**Lim et al. (2013)** used a mixed group study to investigate the neurological treatment effects of neurologic music therapy (NMT) and traditional speech language therapy (SLT) in 21 nonfluent post-stroke patients with sub-acute and chronic aphasia. The sub-acute group consisted of patients who have had their stroke for one to three months, and the chronic group consisted of patients who have experienced their stroke for more than three months. The NMT group received therapeutic singing techniques including MIT and descriptions of respiratory training, voice training, automated singing and speech training. The SLT group focused on language-oriented traditional techniques that consisted of simulating visual and auditory senses, and expression training via spoken language and via pictures of texts. Intervention was conducted one hour per day, two times a week, and for a total of one month. Outcome measures included used a well-recognized aphasia test. No information regarding who completed the testing, or blinding were provided. Changes were analyzed one month post-treatment using appropriate nonparametric statistical analyses. Results revealed significant increase in the NMT group for both sub-acute and chronic groups; this increase was found to be more significant than the SLT group overall. Within the SLT group, improvements were only found for the chronic group. Appropriate statistical analyses were included.

A limitation noted would be again, the heterogeneity of this particular population where it is difficult to replicate the exact study, but the authors were able to group into onset of treatment post-stroke in an effort to keep consistency for comparison of treatment effects. Specific and detailed therapy plans for the NMT group would have been helpful in replication and for future clinicians to incorporate into their practice.

Overall, this study provides suggestive evidence that incorporating musical elements into traditional speech therapy is beneficial.

### Case Series Pre-Post test

**Hurkmans et al. (2015)** conducted a case series pre-posttest design to examine whether verbal communication in daily life improved in individuals with apraxia of speech (AoS) and aphasia using the new developed programme named Speech-Music Therapy for Aphasia (SMTA) in which they integrate speech therapy and music therapy in intervention sessions. The SLP and MT treats the individuals simultaneously. Five participants with AoS accompanied by aphasia were recruited for 24 SMTA sessions, inclusion criteria and a summary of the demographic and diagnostic data of the participants were described in detail.

The SMTA treatment protocol was well-described and provided examples for training at the phoneme, word, and sentence levels, although varied among each participant depending on degree of concern. The authors acknowledged that the nature of the recovery process is unique to all individuals in this population which means the treatment programme was not structured in blocked, but rather used multiple measurements before the treatment as a baseline. Outcome measures included published tests of everyday language, aphasia, apraxia of speech, and diadochokinesis administered at baseline, pretreatment, posttreatment, weekly for 24 sessions, and follow-up testing. The examiner administering the tests was never the repeated, all had experience in testing individuals with AoS and aphasia, and all were blinded. Data were analyzed for change during weekly testing using appropriate statistical analyses, and results were shared with participants.

Results revealed significant improvements in articulation and verbal communication in daily life. The verbal

responses were rated based on comprehensibility and intelligibility. Outcome measures included used a standardized language test. These improvements remained stable after treatment ended, except for intelligibility. Significant improvements were seen in all areas of articulation in 4/5 participants, and an apparent increase in efficiency in communication in daily life. Data also showed some generalization to untrained related materials and to decreasing severity of aphasia.

Overall, this study provides highly suggestive evidence of improving treatment outcomes with musical elements because of the well-planned intervention protocol and research. However, this study is weakened because of small sample size and heterogeneity of the population.

### Systematic Review

**Draper (2016)** conducted a systematic review of literature investigating music-based speech and language treatments in stroke rehabilitation. A total of 15 studies were included in the review.

The author clearly outlined the objective for the review; he wanted to explore the neurological relationship between music and language, and between singing and speaking, and he also wanted to explore the long-term music-based speech and language treatments in post-stroke rehabilitation.

The search terms and both the inclusion and exclusion criteria were well defined. The synthesis process was well described in detail. Results were described by comparing the strength of evidence across studies. Results revealed that a variety of musical interventions were utilized and explored in previous research. Key beneficial elements across studies were identified, which included, 1) singing songs and vocal exercises, 2) stimulating the right hemisphere, and 3) use of speech prosody. The author acknowledged the limitations of the nature of this review, making the robustness of this review weakened.

Overall, this study provides suggestive evidence on incorporating music elements into traditional speech and language therapy.

### *Discussion*

This study provided a critical review of research examining the use of musical elements in traditional speech and language therapy for individual with neurogenic communication disorders. Six studies were included all providing equivocal to highly suggestive evidence for the benefits of incorporating musical elements in speech and language therapy.

The present findings are consistent with previous research regarding MIT in that musical elements are used to contribute to the improvements of neurogenic communication disorders, specifically aphasia and AoS (Hurkmans et al. 2015). The two parallel in results that show improved language repetition with generalization to verbal communication in daily life (Hurkmans et al. 2015).

It must be acknowledged that research in this area is characterized by small sample sizes and heterogeneous participants. Studies included in this review were inherently limited in external validity due to the nature of the condition that the neurogenic communication disorder population is limited to a heterogeneous group. Because of the nature of this population, it is a challenge to conduct large studies for stronger evidence and it is difficult to generalize these findings to the larger population. All of the articles were focused on illustrating the benefits of musical elements, but failed to exhibit strong empirical evidence. Although Lim et al. (2013) and Hurkmans et al. (2015) presented some stronger suggestive evidence, additional empirical evidence is required to determine if incorporating musical elements into traditional speech and language intervention would be beneficial.

While further research is needed, one potential benefit of incorporating musical elements is to increase motivation of speech language intervention in participants (Leung 2008). Leung (2008) reported that patients are more likely to participate in therapy, indicating that it was more enjoyable, and music “distracted” the laborious work of speech therapy. Another benefit of the inclusion is the singing component where it is aligned with the teaching of vocal exercises and speech production (Leung 2008). Draper (2016) suggested that singing requires rhythm, intonation,

prosody, pitch, and oral muscle control; and both singing and speech entail natural expression, frequency range, rhythm, intensity, and diction which improves articulation, intelligibility, and breath control.

Hurkmans et al. (2015) provided an alternate perspective that singing itself does not facilitate speech production, but it is the rhythm that is crucial. Especially, no familiar songs should be used in treatment because speech production is usually automatically generated in this case. Instead, novel melodies should be used in congruence with words and phrases to activate the neural system for speech and language. It is suggested that rhythm can be used to control speech rate. Lim et al. (2013) argued that even inclusion of motor operations such as rhythmic tapping and clapping are beneficial because of shared neural networks of cerebral hemisphere of the motor actions and oral production. These rate-rhythm control strategies could work on dynamics of articulation, such as timing of speech production (Hurkmans et al. 2015).

Taken together, it is agreed by (Draper 2016) that it is difficult to consolidate the key musical elements due to a lack of consistency in approaches and without durations or frequencies in treatment. It is anticipated that this uncertainty may be damaging to the compilation of intervention programs because the amount of treatment required to achieve positive results cannot be estimated (Draper 2016). In addition, it is not known the exact treatment protocols for optimal results.

### ***Conclusion***

Further studies of incorporating musical elements into traditional speech and language intervention are needed. Nevertheless, all of the studies reviewed reported results in the positive direction regarding incorporating musical elements seems across all profiles of individuals with neurogenic communication disorders. No detrimental effects were reported.

### ***Clinical Implications***

Incorporating musical elements into traditional speech and language intervention is an easy, non-invasive and alternative method to improve outcomes in individuals with neurogenic communication disorders.

The overall findings in this critical review indicate that the evidence is suggestive. The aspect of musical elements is so broad and the articles failed to pinpoint one particular musical element as an effective method that it is difficult to say which aspect is effectively contributing to the outcomes. Understandably, it is difficult to isolate the musical variable that is contributing to the result, even though there are studies that look at a specific disorder profile. As a result, clinicians must adopt an objective approach in treatment to evaluate responses with individual clients when incorporating musical elements.

#### ***Future Research Considerations:***

I. A comparison of outcomes when SLP incorporates musical elements alone versus SLP working with a MT

II. Further research investigating if the severity of NCD would affect the treatment outcomes

III. Future research to explore one musical element paired with one particular type of neural damage/disorder

IV. Further research and discussion of including musical elements in the perspective of a Speech Language Pathologist

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