Speech-Language Pathology and Music Therapy: An Underrated Combination for Many with Stuttering Disorders

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Abstract

Communication disorders such as stuttering can take a serious toll on one's mental, physical, and emotional wellbeing. Given that we live in such a fast-paced society, the visible impact of communication disorders has become increasingly prevalent. Music therapy can be a way to help. Music therapy techniques have been utilized for the treatment of other communication disorders (such as apraxia, aphasia, and language learning disorders) but have been underutilized for the treatment of fluency disorders. My project argues that a multi-disciplinary approach that combines speech therapy and music therapy will further advance the treatment of stuttering. The effects of music therapy can focus on improving both the voice and the confidence of the participant while at the same time increasing the retainability of the lessons taught and the overall success of the treatment. This paper examines a variety of speech language pathology techniques that could be co-delivered with music therapy to better speech production for those with fluency disorders. This project shows that combining both speech language pathology and music therapy techniques deserves more devoted research, as there are many ways in which this combination will benefit patients who stutter.

Keywords: speech language pathology, music therapy, fluency disorders, stuttering

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In a world where speed has become increasingly important, and patience has often fallen to the wayside, living with a communication disorder such as stuttering can take a serious toll on a person's mental, physical, and emotional health. When no one seems to have the time to listen, it diminishes the concept of communication for anyone involved, taking away this element of their humanity one piece at a time.

Communication has always been a key element for both human survival and human development. No matter where in the world one can look, it is clear that communities developed language on their own accord to better communicate with each other, leading to the many different languages humanity speaks today. Language has the power to bring people together, but for those who may not be able to match those around them, it can also make others feel even more isolated. Imagine if you were in a country where you knew no one and could not use the language, what would you do? Would you be given the time of day by those around you, or would you be left on your own and judged by those passing you by? While this is not the reality for many with communication disorders, having a disorder of this sort does increase the likelihood for this type of occurrence and can cause those who do not understand the situation to have a pre-assumed version of you in their head, one which you may never fully be able to overwrite, even with time.

To tackle these communication disorders, many types of language therapy can be used, often led by a Speech-Language Pathologist (SLP). Vocal strength exercises and speed training, along with electronic communication devices, are just some of the techniques and tactics used by these SLPs to improve the communication abilities of their clients. A multi-disciplinary approach

that combines speech therapy and music therapy can further better the treatment of stuttering as the effects of music therapy often can focus on similarly bettering both the voice and confidence of the participant along with increasing the retainability of the lessons and the overall success of the treatment for the client.

History of Speech-Language Pathology

Speech-language pathology has been present in society as a form of treatment since the 1920's, but the concept of correcting speech patterns and lessening communication disorders has been around for much longer (Dewey, 2020). One of the earliest speech-language pathology experiments was led by a well-known orator named Demosthenes, who lived from 384 to 322 BCE (Dewey, 2020). He directed his experiment in hopes to correct his own stutter and his issue of softening "r" sounds into the "w" sound, and to do this, practiced reciting aloud with rounded pebbles in his mouth (Dewey, 2020). This shows that throughout history, language has been a vital part of society, and those who had fluency or other speech issues have been aiming to correct them since the beginning. In every case, historically and currently, the three base concepts of speech pathology can be seen, of which are: diagnosis, treatment, and rehabilitation (Dewey, 2020). As with any physical or mental issue, speech differences can be best treated the earlier they are caught. However, there is not enough widespread knowledge on speech disorders, therefore preventing people such as teachers from making the differentiation between a speech disorder versus a learning disorder in children, and therefore getting the child the assistance they need rather than simply placing them into special education classes.

Speech-language pathology is not limited to purely treating children however, as the field took off after the end of World War II, as Speech-Language Pathologists (SLPs) did an exceeding amount of research on how post-traumatic stress disorder (PTSD), at that time

considered shell shock, led to impacted speech along with how head wounds affected soldiers and how hearing loss developed from extended exposure to gunfire (Dewey, 2020). Today, SLPs focus on encouraging patients to practice their speech using set drills and phrases to bring or return them to the highest level of speech competency as possible, all while focusing on also building the confidence of the patient, as those with communication disorders are often subject to ridicule or fall into anxious or depressive states due to their condition. However, SLPs do not only work alone, as they also often collaborate with teachers, health professionals such as doctors, Physical Therapists or Occupational Therapists, or others such as dentists or psychologists. Those included in these interprofessional groups will vary depending on the needs of the specific patient. SLPs diagnose and treat a wide variety of clinical issues, some of which include developmental speech issues such as stuttering, speech issues stemming from traumatic brain injuries (TBIs), dementia, or early-onset Alzheimer's, minimizing and preventing swallowing issues, or even assisting someone with minimizing or eliminating an unwanted lingering accent (Dewey, 2020). In this way, it can be seen how far-reaching the field can be, and how important it is to any who suffer from speech or language disorders.

History of Music Therapy

Music therapy also has a lengthy history, but has only begun to be used in specific context as a practice in more recent years. The earliest mention of music therapy was in an article in Columbian Magazine in 1789 that discussed the "basic principles of music therapy that are still in use today and provided evidence of music therapy practice in Europe" (Hryniw Byers, 2016). As time progressed, more articles came out discussing the use of music in treatment of pain and other ailments. However, the profession was not truly founded until World War II, when music programs were established to boost morale and improve health outcomes of

wounded servicemen (Hryniw Byers, 2016). In the words of the Special Services Music Officer, Captain Howard C. Bronson, “music is one of the vital elements of a fighting Army”, and the success of the music recreation service led to the development of the U.S. Army’s Reconditioning Program, which aimed at helping wounded men return to either “duty or civilian life in the best possible physical and mental condition” (Hryniw Byers, 2016). After this, a national survey was completed that focused on the use of music in mental hospitals, and because of the results of this survey, a program was created that was based on the belief “that music is effective in bringing people together, releasing emotions, and creating a feeling of community” (Hryniw Byers, 2016). This program had three separate sections, and they were that of active participation, which included playing instruments for therapeutic reasons such as those with chest issues learning wind instruments; passive participation; which was watching people play instruments or listening to music and then discussing your appreciation of it; and audio reception, which consisted of listening to music without any specific reaction or response being required (Hryniw Byers, 2016). Using the new skills they gained in these sections, they formed orchestras, singing groups, and played for others in the hospital, which raised both their morale and the morale of those around them (Hryniw Byers, 2016). Even at this point these tactics were not considered “music therapy” as there was not enough supporting scientific evidence (Hryniw Byers, 2016). When a study was completed in 1944, the results did prove that the Army’s program improved health outcomes for 74% of the participants through the use of music (Hryniw Byers, 2016). The National Association for Music Therapy was founded in 1950, and since then the establishment of the Registered Music Therapist (RMT) qualification has been added, along with degree programs and requirements (Hryniw Byers, 2016).

By definition, music therapy is the "clinical and evidence-based use of music, including playing instruments and singing, in therapeutic practice" (Appello, 2021). Some situations or issues that may be assisted by the use of music therapy include aggressive behavior in children, autism, language disabilities, stress, Tourette's syndrome, or movement disorders, along with possibly being able to assist with PTSD and stroke patients (Appello, 2021). For example, Melodic Intonation Therapy can be used with children with autism, as many children with autism have musical abilities, and this specific therapy combines music with singing and can therefore assist in learning and developing language skills (Appello, 2021). Music therapy also can assist physical rehabilitation, such as with Parkinson's Disease patients, as the rhythm to a song can help the patient anticipate their next movement and therefore move more smoothly and naturally (Appello, 2021). Specifically during the time of the COVID-19 pandemic, communities throughout the world dealt with heightened levels of depression and anxiety, but did report that the ability to engage with music helped to life their spirits and minimize stress (Appello, 2021). Currently, music therapists are known to work in many different scenarios, both with and without collaboration with other professionals, although collaboration is more common than not. Music therapists may work with SLPs, para-educators, or members of a medical team to create the best plan for their client (Hryniw Byers, 2016).

Results of Music Therapy Treatment for Stuttering

SLP has been well-known as a treatment option for those who stutter for a long time, but music therapy's ability to treat those who stutter has also begun to be researched. A 2019 study based in Limerick, Ireland focused on treating a group of 11 adolescents with five group music therapy sessions over the period of a week-long intensive therapy camp for those who stutter (O'Donoghue et al., 2021). However, only 4 of the 11 participants agreed to participate in the

research study interview questions after the treatment was finished. The treatment focused on offering a variety of opportunities through the implementation of music therapy: “to discuss feelings in relation to experiences of stammering, (2) to listen to others’ musical and verbal contributions, (3) to gain insight into social strengths e.g., friendship, listening, supporting others (4) to reduce anxiety associated with stammering, and (5) to offer the opportunity to practice different ways of communicating with peers” (O’Donoghue et al., 2021). This was done by listening to music, singing, music improvisation, and songwriting and composition (O’Donoghue et al., 2021). The 4 participants who chose to answer the study questions reported that after their experience, that they believed that “music therapy should be integrated into the stammering [stuttering] treatment process alongside traditional therapies” and one specifically stated that music therapy should be used “alongside speech and language therapy for adolescents who stammer [stutter] (as it could) could be useful in terms of building confidence” (O’Donoghue et al., 2021). In total, the therapy allowed them to work together as a team to improve their skills in a comfortable environment with those who understand their struggles, make new friendships, build confidence, explore new opportunities such as playing instruments, and a sense of renewal in excitement with improving their speech disorder (O’Donoghue et al., 2021). This study shows that when treatment is applied in a social way such as with group therapy, success and retention rates along with the personal well-being of the clients are all increased.

What is Stuttering

Stuttering is “a speech disorder characterized by the repetition of sounds, syllables, or words, the prolongation of sounds, and other interruptions or hesitations in speech known as blocks” (NIH, 2017). When someone has a stutter, their comprehension of language and words is not affected, but their fluency and ability to verbally produce the words in the way they want to

speak them is. Struggle behaviors can also come along with the characteristic speech blocks of someone with a stutter, and these struggle behaviors could include rapid eye blinking, lip tremors, or head twitches (NIH, 2017). Stuttering heavily impacts the quality of life for those impacted by it, as it can make interpersonal relationships or job performance difficult, and can affect important situations such as job interviews (NIH, 2017). When in a high-stress situation, such as an interview or while on the phone, these speech blocks and repetitions can increase in frequency, and make the scenario even harder than expected (NIH, 2017). However, calmness, which can be brought out by singing, reading, or speaking in unison with a group, has been shown to reduce the severity of a person's stutter and related issues (NIH, 2017).

The cause of stuttering is still not fully understood, but there are a variety of possible causes being researched to this day. It has been found that those who stutter have imbalanced activity of the two brain hemispheres as compared to fluent speakers, where a region in the left frontal brain is hypoactive, while the corresponding region in the right hemisphere is hyperactive (Neef, 2017). This is important, as hyperactivity in regions of the right hemisphere seem to be central for stuttering, and parts of the right inferior frontal gyrus are particularly active when we stop doing actions, such as hand or speech movements (Neef, 2017). In this way, it shows that the brain may be working more than it does normally when stopping the person's fluency, therefore leading to the unintended speech blocks. The left inferior frontal gyrus, which processes the planning of speech movements, and the left motor cortex, which controls the actual speech movements, have both been found to also possibly be involved with the root cause of stuttering due to their designed actions (Neef, 2017). If these two processes are being randomly inhibited, the affected person will also be unable to speak fluently. Because of these reasons,

neural inhibition is thought to be one cause of stuttering, but there is insufficient research to fully determine this.

Stuttering can appear early in life between two to five years of age, when children are learning speech and language skills; can appear after a stroke, disease, or other type of traumatic injury affecting the brain or spinal cord; or can appear suddenly after an emotional trauma or very high levels of stress (Stanford Children's Health, 2021; NIH, 2017; Tasko, n.d.). With each of these types, slightly different speech and physical elements can be impacted. With developmental stuttering: fluency and rhythm are mainly impacted, issues often occur at the beginning of utterances, the intensity of their stuttering is heavily influenced by their environment, body movement struggle behaviors can occur, and this type of stuttering is associated with anxiety, fear, and guilt (Stanford Children's Health, 2021). However, with neurogenic stuttering, there is more commonly partial-word or specific phoneme repetitions, their stuttering is not restricted to initial words in a sentence, there are no specific patterns, and they are less responsive to treatment and not associated with anxiety or other issues (Molt & Yaruss, n.d.). Lastly, with psychogenic stuttering, there can be repetition of the first or stressed words in a sentence, there is no stutter free speech, and at first, as it stems from a traumatic event, there is commonly no interest in initially correcting the stutter (Tasko, n.d.).

There are currently a variety of options available for those who stutter, with some being more useful for certain categories. For example, treatment mainly depends on age, communication goals, and other elements, but using the prior three categories, certain techniques have been proven to be more useful or successful in treating stutters. Given developmental stuttering mainly affects those between two and five, some techniques can be taught to the child such as showing them how to slow down their speech and breathe while talking to take breaks, but the

parent also plays a role in this scenario, as they are taught how to listen attentively and how to slow their own speech and therefore model for their child (Stanford Children's Health, 2021). With neurogenic, the patients have been in control of speech for a good time, so they can be taught these tricks without the necessary backup of another person. There is no one specific approach for those with neurogenic stuttering, but a variety of techniques can be taught such as how to have a gentle onset of breath in the beginning of a sentence to increase relaxation and how to slow the rate of their speech (Molt & Yaruss, n.d.). These patients can also work on smooth production and fluency exercises along with word and sentence breakdowns and build ups (Molt & Yaruss, n.d.). Thirdly, those with psychogenic stutters can alter the length of pauses between words or syllables and make postural changes to the jaw for the purpose of relieving tension and therefore relaxing speech and lessening stuttering. Therapy for this category is also often done in conjunction with a psychologist or psychiatrist (Team Stamurai, n.d.).

There are also other stuttering treatment options such as the use of electronic devices such as delayed auditory feedback devices which can fit in an ear like a hearing aid and replay a delayed version of the wearer's voice back to them, therefore forcing their speech to slow down (Mayo Clinic Staff, 2021). Other electronic devices mimic speech so it sounds as if you are talking in unison with the person you are with, which is also meant to slow speech and processing (NIH, 2017). Cognitive behavioral therapy is another option for those who stutter, as it helps to identify and change negative thought processes and therefore resolve stress, anxiety, and self-esteem issues related to stuttering (Mayo Clinic Staff, 2021). While no drug treatment for stuttering has been approved by the FDA, some epilepsy, anxiety, or depression medications have been used over time to treat stuttering (NIH, 2017). Lastly, self-help groups have been found to be useful as they connect similar people together and give them support through comradery and first-hand

advice, which can be useful if suffering from related mental health issues such as anxiety or depression (NIH, 2017).

Current Uses of Multidisciplinary Speech-Language Pathology and Music Therapy Treatments

Apraxia and Aphasia Treatment

The concept of combining speech-language pathology and music therapy is not a new idea, as this technique has been used in a variety of scenarios with wide reaching effects. Some of the more common disorders that have been treated with Co-Delivered Integrative Music and Language Therapy (CIMaLT), are apraxia and aphasia. Apraxia and aphasia can result from the occurrence of a stroke, and while they have many similarities, they are still very different (ASA, 2018). Apraxia causes "difficulty initiating and executing [the] voluntary movement patterns necessary to produce speech when there is no paralysis or weakness of speech muscles" (ASA, 2018). This can cause difficulty producing desired speech sounds or using rhythm when speaking to control the rate at which speech is produced (ASA, 2018). Aphasia however, is "impairment in the ability to use or comprehend words", and can cause difficulty in understanding words, finding the word to express a thought, understanding grammatical sentences and reading or writing words or sentences (ASA, 2018). Given these similarities and differences, some ways in which Apraxia can be treated include teaching sound production using repetition, teaching rhythm and rate of speaking, and providing alternative communication systems for patients that require a minimally verbal communication system (ASA, 2018). However, some ways in which Aphasia can be treated therapeutically include restoring language ability by using stimulating clues, word and picture matching to encourage the understanding of spoken words, and learning

compensating communication methods such as using gestures or writing thoughts and statements down in replacement of verbal speech (ASA, 2018).

The concept of combined treatment using both speech-language pathology and music therapy came about when professionals observed almost 50 years ago that there is "preservation of the ability to sing in the presence of severe expressive aphasia" (Johnson et al., 2019). Seeing the combined issues that can be improved upon using therapeutic approaches, it is clear how music therapy can link together with SLP to create a stronger and more permanent improvement in patient's lives. For example, with apraxia, repeated sounds can be placed into a musical setting such as a song to help improve movements while providing more entertaining ways to practice speech production skills and improve upon oral muscle movement. Also, rhythm can be practiced and taught using a metronome or by snapping and having the patient speak or sing to the rhythms involved (ASA, 2018). This has been proven, as the use of CIMaLT in clinical trials was shown to increase personal awareness of correct and incorrect productions and better the patient's ability to intermittently shape and self-correct pronunciations of targeted speech sounds Johnson et al., 2019). One severe aphasia patient with limited repetition ability who had been attending traditional speech-language therapy for three years, but showing little progress, was allowed to participate in 11 50-minute, once a week group CIMaLT sessions (Johnson et al., 2019). During this period, she was able to increase her accuracy from 20% to 60% when intimidating simple drum patterns, and was then placed in a 5-week long period of individual CIMaLT sessions, which allowed her to achieve 96% accuracy with all of her vowel productions by the end of the 5 weeks (Johnson et al., 2019). This alone shows how much change the therapy was able to make for this client, as 20% accuracy in basic rhythms to 96% accuracy in vowel production is a massive leap for speech production. The song used in her therapy was created by

a student Music Therapist and a student SLP, and done so in a way that the song incorporated functionally relevant vocabulary such as the name of the woman's spouse, pet dog, and other useful words such as "sugar, shoes, shop", that intentionally target the /ʃ/ phoneme, which was being specifically focused on in the therapy (Johnson et al., 2019). With these changes and roughly 70 sessions of therapy, the patient is now very aware of her correct versus incorrect speech productions, able to shape and self-correct speech productions intermittently, which she was nearly unable to do to any extent before, and can accurately and successfully produce the /ʃ/ phoneme 100% of the time, rather than the 30% success rate she was at before the 11 weeks (Johnson et al., 2019). She was also able to approximate her dog's name and greet the therapists with "good morning" even though multiple weeks had passed since her last therapy session, proving the long-lasting effects of the treatment (Johnson et al., 2019). Constant repetition of the same words and phonemes, as with speech therapy, can become tiring for patients. Music therapy presents exercises in a hands-on and personalized way such as with the song that works on all of the main therapy points together. Experimental evidence shows that use of the personalized song and musical intervention may help patients catch onto the repetitions and pronunciations faster and with a more lasting effect than with speech therapy alone.

Language Learning Disorder Treatment

Combined SLP and Music Therapy have also been preliminarily applied in treating the language skills of an adolescent female with a Language Learning Disorder (LLD) through the use of interactive metronome training (IM) (Sabado & Fuller, 2008). An IM is an "innovative, patented, microcomputer-based version of the traditional music metronome", and "includes a computer, headphones, and two contact sensing triggers (one for the hand and one for the foot)" (Sabado & Fuller, 2008). A steady metronomic beat is played through the headphones and the

user is meant to produce a continuous rhythmic beat with the movements of their hands and/or feet in response to the audio (Sabado & Fuller, 2008). These reactions are then analyzed in a software according to speed and accuracy, and adjustments are made until the user becomes able to match the auditory stimuli (Sabado & Fuller, 2008). The training program lasts for 15 sessions and each session has predetermined objectives and instructions on how to perform the required movements, each of which can be made so that is accommodates specific users (Sabado & Fuller, 2008). The treatment has been found to be beneficial with increasing motor, cognitive, and academic performance (Sabado & Fuller, 2008). It has been tested on golfers, those with ADHD, the female in the Sabado and Fuller (2008) study, and more as an upcoming treatment possibility (Sabado & Fuller, 2008).

In the Sabado and Fuller study from 2008, IM was used to treat a 13-year-old female named Renee from Bulgaria that was adopted into an American family at the age of 4 ½. Once her adoptive parents began to realize her communication deficit while she was in kindergarten, they sent her to speech-language therapy, which she attended until she was in 6th grade, at which point the services were discontinued (Sabado & Fuller, 2008). She was later assessed for her language abilities and was found to be in the 8th percentile for receptive language, less than the 1st percentile for expressive language, and in the 1st percentile for an overall standard score (Sabado & Fuller, 2008). She was then diagnosed with LLD and re-referred to an SLP, which is where the IM training occurred for her (Sabado & Fuller, 2008). Pretests and posttests using the Expressive One-Word Picture Vocabulary Test (EOWPVT) and the Oral and Written Language Scales (OWLS) were conducted rightfully before and after the therapy was conducted, and it was found that Renee's standard scores improved dramatically pre to post treatment (Sabado & Fuller, 2008). Her standard score on the EOWPVT from the pretest was 93 and she was listed in the 66th

percentile, which is equal to the level of an 11 year old (Sabado & Fuller, 2008). However, after the month-long treatment, the standard score of 93 changed to a 124 with a percentile rank of 95, bringing her to the level of someone over the age of 19 (Sabado & Fuller, 2008). Her OWLS score also improved, as she received a pretest standard score of 86 and was placed into the 18th percentile, which is the level of a standard 9½ year old (Sabado & Fuller, 2008). Her posttest scores however, showed the standard score raising to 99 and her being listed in the 47th percentile rank, which is a standard age of almost 13 years (Sabado & Fuller, 2008). Along with raising her scored dramatically on each of these tests, it was found that she had completed more tasks on the posttests than for the pretests, Renee herself reported that her mind now felt "cleaner and lighter", and her mother noticed her taking less time to process language and that she could now better handle frustrating situations on a day-to-day basis (Sabado & Fuller, 2008). The use of this treatment has been likened to the use of delayed auditory feedback due to both therapies effects on disfluent speech and melodic intonation therapy due to their similar effects on neural organization improvement (Sabado & Fuller, 2008). While the therapy can be performed alone, it being a jointly-used tool for SLPs and Music Therapists could increase the productivity of treatment for many others with cognitive processing difficulties due to its focus in timing and rhythm (Sabado & Fuller, 2008).

Current and Possible Future Applications of Combined Multidisciplinary Speech-Language Pathology and Music Therapy Treatments for People Who Stutter

Given the success of the current applications of combined multidisciplinary SLP and Music Therapy treatment, it is clear that joint treatment should be applied in more therapy settings, such as using the combination to treat those who stutter. Currently, minimal research has been completed on the effects of these combined therapy techniques with stuttering patients

specifically. However, even with the data that is available, the positive future possibilities for treatment become even clearer.

Co-Delivered Integrative Music and Language Therapy Treatment

There are many ways in which Co-Delivered Integrative Music and Language Therapy (CIMaLT) could be applied in a treatment scenario for those who stutter. First, using the rhythms and musicality of the applied music therapy, the patient will be able to lessen or temporarily remove their stutter, as it is known that a person's stutter is removed by over 90% during and after 10 minutes of singing, likely due to the remaining hyperactivity in the right brain's motor system (Fox et al., 1996). Utilizing this can allow SLPs and Music Therapists to train the client on ways to speak more smoothly and use soft beginnings to words, as often used in music. The concept of soft entrances to words has been a previously used technique in speech therapy, but having a more well-known example to show the client how to do it such as with a song they already are aware of or know will cause the client to pick up on the concept faster, more thoroughly, and more permanently (Johnson et al., 2019). This knowledge of technique will allow treatment to progress more smoothly and allow the patient to work towards fluent speech through the use of slowly lessening the amount of musicality in their statements until they can say the aimed phrases without stuttering. CIMaLT can also be applied with the use of rhythm practice and repetitive sound training, similarly to Interactive Metronome Training, which will be discussed later. With CIMaLT, the repetitive sound training will allow the patient to become more used to saying certain difficult phrases or words more smoothly and can help them work on how to correct themselves when they have become stuck on a word or phrase (Johnson et al., 2019). The specific rhythm regulates the phrasing of the patient and may get them into the rhythm of speaking that is similar enough to singing, therefore lessening or limiting their stutter,

which can then be applied when they are speaking out of therapy. In all, the use of CIMaLT will allow patients to understand and use speaking techniques more thoroughly and quickly, and may allow them to become more used to phrases or words through the use of a set tempo (Johnson et al., 2019).

Interactive Metronome Training, Melodic Intonation Therapy, and Neurologic Music Therapy Treatments

Similarly to CIMaLT, IM will provide a more interesting and interactive element to repetitive sound training. It forces rhythm onto sentences to better the flow of the words until the metronome can be slowly removed and still have the patient say the phrases with the correct fluency (Sabado & Fuller, 2008). IM has been compared to the current SLP technique of delayed auditory feedback (DAF), as both IM and DAF aim to better disfluent speech through the use of varied timing and rhythm for speech (Sabado & Fuller, 2008). They both make use of speech timing to do this, as when speech is slowed down through either of these techniques, it has been found that intelligibility and fluency improve drastically (Sabado & Fuller, 2008).

Melodic Intonation Therapy (MIT) is also compared to IM through its use of rhythmic timing for utterances to improve the expressive speech and language capabilities of the patient (Sabado & Fuller, 2008). Both MIT and IM have similar effects on neural organization, therefore allowing the patient to sort out their utterances more thoroughly and therefore produce them more successfully (Sabado & Fuller, 2008). In this way, these treatments can be used in addition to the current applications of SLP treatment for those who stutter, as it can better the success of the current techniques such as word repetition and rhythm speech training.

Neurologic Music Therapy, or NMT, involves multiple techniques such as MIT, Rhythmic Speech Cueing, and Therapeutic Singing to create sung or chanted melodies that

mirror natural speech intonation patterns that then can be transferred back into normal language (Clements-Cortes, 2012). MIT is used in this scenario to apply slow, pitched vocalization or singing with rhythmic tapping of the hand to vocalize the syllables involved in the word production (Clements-Cortes, 2012). This is then sped up slowly until it has reached a common speaking rate (Clements-Cortes, 2012). Rhythmic Speech Cueing, which has been proven successful for speech treatment, involves rhythmic speaking in patterns that simulate the stressed inflections of normal speech (Clements-Cortes, 2012). Finally, Therapeutic Singing focuses on the initiation, development and articulation involved in speech and works on improving breath support for speech (Clements-Cortes, 2012). These increase familiarity with speech and rhythm along with increasing phonation duration and intonation, therefore decreasing the amount of stuttering (Clements-Cortes, 2012).

Parallel Techniques for Therapy

The combination of Music Therapy and SLP does not have to be exactly hand in hand, but can instead be parallel with the effects of one's use causing positive change in the results of the other. One example could be with the concept of group music therapy, where progress was made with the treatment, but one of the most influential elements of the scenario ended up being that of a large increase in confidence for the participants due to their comfort with being in a situation with others similar to them that could understand their issues (O'Donoghue et al., 2021). This increased the sense or comradery within the group and allowed them to see that they were not alone in their struggles (O'Donoghue et al., 2021). This therefore made them willing to stick with the program, put their best foot forwards, and try their hardest to succeed and lift their new friends up with them (O'Donoghue et al., 2021). With this group comradery came yet another main positive of this scenario, which was the ability for the members to be in a relaxed

scenario where they did not have to try to hide their struggles and therefore had less stress (O'Donoghue et al., 2021). When in a situation where stress is lessened, the impacts of stuttering are also lessened, as stuttering is very environment based, meaning increased stress causes increased difficulty for the person involved. When stress is lessened, content that is learned also remains in the memory of those receiving the teaching more thoroughly and permanently, as they were not distracted by their own worry or embarrassment. The elements of fun and emphasis on enjoyment of the situation also made the therapy more enjoyable for those involved and increased excitement to return and learn more, which will likely better the outcome of long-term treatment of both this Music Therapy and SLP.

Conclusion

Although there are many more ways in which SLP and Music Therapy could be combined to create a better environment and process for those being treated, there is not enough specific research completed on these topics to thoroughly confirm these findings. In this way, more research on this combination is necessary, as even with the limited amount of knowledge available, the many ways in which these when combined will be beneficial to patients who stutter can be easily seen. All of these elements discussed have been proven to better speech production, and clearly have many similarities to current SLP techniques, so the combination of the SLP and Music Therapy techniques such as these will likely better the overall success of treatment for those with stutters. Given that so many of these techniques already lie hand in hand, the multidisciplinary aspects of therapy would also not be a far reach for those involved. In conclusion, these results show that a multi-disciplinary approach using both speech therapy and music therapy should be utilized for those who stutter, as it will increase the retainability of the lessons, the confidence of the clients involved, and the overall success of the treatment.

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