INFORMED SONGWRITING PRACTICE FOR MUSIC THERAPY TREATMENT OF CHILDHOOD SPEECH SOUND DISORDERS

by

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Abstract

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Developmental speech sound disorders (SSDs) are characterized by impairment of the production of speech sounds that form words for verbal communication, either due to flawed articulatory or phonological processes. The purpose of this study was to investigate the nexus of music therapy and specific speech-language therapy interventions to treat children with speech sound disorders. Using the Neurologic Music Therapy Transformational Design Model and considerations for strategic songwriting, the researcher has developed a process for strategic songwriting in music therapy treatment of childhood SSDs. Two originally composed songs and their clinical applications are presented.

Keywords: music therapy, Neurologic Music Therapy, speech language pathology, developmental speech sound disorders, articulation, phonology, songwriting, transformational design model, developmental speech and language training through music

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Chapter 1

Introduction

According to Tanner (2001), approximately 40 million people in America have a communication disorder (as cited in American Speech-Language-Hearing Association [ASHA], n.d.a). The *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; American Psychiatric Association, 2013) defines a communication disorder as any impairment of an individual's ability to receive, understand, and express ideas either verbally or nonverbally. These may be disorders of language, speech, or hearing (American Psychiatric Association, 2013). Language disorders are characterized by impairment in understanding of the meaning of words, how they are formed, and how to put them together in order to functionally convey meaning. Speech disorders are characterized by impairment of the production of speech sounds that form words for verbal communication. Aspects of speech that may be impaired include articulation, fluency, and voicing. Communication disorders are seen across the life span and can be acquired or developmental (ASHA, 1993).

One subset of communication disorders that is prevalent in children are speech sound disorders. According to the National Institute on Deafness and Other Communication Disorders (2010), speech sound disorders are present in approximately 8 to 9 percent of children. Speech sound disorders (SSDs) are communication disorders characterized by impairment of the production of speech sounds that form words for verbal communication (ASHA, n.d.a). While they can be acquired by both children and adults from stroke or traumatic brain injury, SSDs most frequently emerge during the developmental period. Some SSDs result from underlying conditions, such as Down syndrome, but most have no known cause (ASHA, n.d.a).

Neurodevelopment and Early Intervention

The ability of the brain to change and make new connections is called neuroplasticity. Neuroplasticity decreases with age; while it is not impossible, it becomes increasingly difficult for the brain to make new connections later in life. The pediatric brain forms rapidly in the first five years of life, making hundreds of new neural connections every second. This period of neurodevelopment is critical because it lays the somewhat simple foundation for more advanced learning throughout the child's life. After this initial period of development in the brain, neural connections that have not been activated are pruned, or reduced, in order to increase the efficiency of the circuits that are used. The specific neural connections for language acquisition stop developing around age six (Center on the Developing Child at Harvard University, 2015).

Because of the reduction in neuroplasticity, early intervention is incredibly important to the success of a child with disabilities. Part C of the Individuals with Disabilities Education Act (IDEA) outlines provisions for children birth to two years old to receive disability services. Part B of IDEA provides services for individuals ages three to twenty-one (Turnbull, Turnbull, & Wehmeyer, as cited in Adamek & Darrow, 2010). In the 2014–2015 school year, over 1,232,500 children in U.S. states and territories under the age of six received services under IDEA. Over 44% of those children between the ages of three and five were receiving services for speech and language impairments (U.S. Department of Education, 2015).

Early Intervention Therapies and Co-Treatment

Speech-Language Pathologists (SLPs) are qualified to provide assessment and interventions for children with speech and language impairments (ASHA, 2008). Music

therapists also provide services for this population. McCarthy, Geist, Zojwala, and Schock (2008) found that 23.2% of music therapists serve children ages 0 to 2, and 49.8% serve children ages 3 to 5 with a wide variety of diagnoses, including language and learning impairments. They also found roughly 75% of music therapists will work with speech therapists at some point during their careers, either by exchanging professional information or co-treating. Many music therapists reported having worked with SLPs in settings that provide early intervention services, including early childhood centers (7%), public schools (40%), and private schools (20%).

Common goals of collaboration between SLPs and music therapists include producing clearer speech, improving words the client is unable to say, speaking with a better rhythm, and improving rate of speech (McCarthy et al., 2008). Hobson (2006a, 2006b) discussed collaboration of SLPs and music therapists in the treatment of neurogenic communication disorders, outlining common interventions of both professions and helpful guidelines for co-treatment. Specifics of collaboration between music therapists and SLPs in early intervention for developmental communication disorders have not yet been examined in this manner.

Statement of the Problem

Few research articles are available on the use of Developmental Speech and Language Training through Music (DSLM) to address developmental speech and language needs in music therapy (Lagasse, 2011; Lagasse, 2014; Lim, 2010; Thaut, 2005). While some of the articles and examples provided include articulation and phonological goals, none of the literature has explored the use of DSLM with children with developmental speech sound disorders.

Song composition in music therapy has been said to be "a key asset for creating varied, compelling, and customized opportunities" for children with SSDs to practice the target sounds being worked on in speech therapy (Howland, 2014, p. 307). There is, however, very little literature on the best way to structure these songs for maximum benefits. This paper will explore how specific speech-language therapy treatments for children with speech sound disorders can inform the songwriting process of music therapists to facilitate growth and change in children with speech sound disorders. Two songs will be presented including discussion of the attributes of each song relevant to children with speech sound disorders.

Definitions of Terms

Music Therapy

Music therapy is a credentialed, evidence-based health profession in which music is used as a therapeutic tool to promote health and positive change (American Music Therapy Association [AMTA], 2015). Music therapists complete extensive training, including an undergraduate or graduate-equivalency degree from an AMTA approved program that includes 1200 clinical training hours. Upon completion of all degree requirements, graduates may take the certification exam administered by the Certification Board for Music Therapists. There are currently 6,652 Board Certified Music Therapists in the United States (Certification Board for Music Therapists, 2015). They are qualified to use active and receptive music therapy experiences to assess and treat clients with physical, behavioral, social, cognitive, psychological, emotional, communicative, and/or spiritual needs. Services can be provided in group or individual sessions. Music therapists work in a variety of settings, including, but not limited to: medical centers, psychiatric hospitals, rehabilitation

facilities, residential treatment facilities, schools, hospice and palliative care programs, and private practice (AMTA, 2015).

Neurologic Music Therapy

Neurologic Music Therapy (NMT) is a subset of music therapy that includes 20 specific techniques based on scientific evidence of music's influence on the brain (Thaut, 2005). These techniques have been developed to address cognitive, affective, sensory, language, speech, and motor needs caused by disease or injury to the nervous system. NMT can be used for both rehabilitation and habilitation. Additional training is needed to receive the Neurologic Music Therapist designation (Academy of Neurologic Music Therapy, n.d.).

Speech-Language Pathology

Speech-language pathology is the treatment of communication and swallowing disorders in both children and adults (American-Speech-Language-Hearing Association, 2015). Speech-language pathologists (SLPs) are required to complete graduate level training, clinical experiences, and take an exam for national certification. They are certified to assess, diagnose, and treat speech, language, social communication, and swallowing disorders, as well as train caregivers and other professionals to help in treatment outside of speech-language sessions. There are currently more than 142,000 SLPs represented by the American Speech-Language-Hearing Association. SLPs often work in collaboration with teachers, physicians, social workers, and professionals in other therapeutic disciplines as part of an interdisciplinary team.

Chapter 2

Literature Review

Typical Speech Sound Acquisition

Although there is still much discussion about the exact mechanics underlying how children develop the ability to understand and utilize spoken language, it is known that the process begins extremely early in development. Studies have been conducted that show humans start becoming familiar with aspects of language prior to birth (Bauman-Waengler, 2016). Crying, cooing, and babbling in infancy are the beginning stages of speech and language skill development. The melody contour, or rising and falling, of newborn's cries follow the patterns of intonation typically found in their native language (Mampe, Friederici, Christophe, & Wermke, 2009). Researchers have also found the complexity and diversity of babbling, as determined by the number and frequency of consonant-like and vowel-like sounds, serves as an indication of later language growth (Bauman-Waengler, 2016). Werker and Tees (2002) found that infants between 6 and 8 months old are able to discriminate between similar speech sounds in a non-native language significantly better than adults. The ability to do so significantly declines between 10 and 12 months of age, suggesting children's perceptual systems have become geared towards their native languages by the time they begin speaking.

Children typically begin to say their first functional words around 1-year-old (Bauman-Waengler, 2016). Functional does not necessarily mean perfect, but rather the consistent use of appropriate speech sounds for the representation of an object or person. Some examples of this would be "dada" for "daddy" and "baba" for "bottle." The speech sounds produced are manifestations of phonemes, or the smallest unit of language that can

establish the meaning of words. For example, the phonemes “p, c, ch” are realized by the speech sounds “puh, cuh, chuh.” Alone these have no functional communicative meaning, but replacing them with one another as in “pat,” “cat,” and “chat” create three very different words.

The ability to produce certain speech sounds is acquired at different times and in a certain order during development. Although many studies have been conducted, and there is certainly variation among individuals, Eric Sander’s data is often cited as the basis of typical speech sound acquisition (Turnbull, 2010). According to Sander (1972), mastery is the correct articulation of a consonant in two different word positions (initial, as in “**d**og;” medial, as in “la**dd**er;” final, as in “ba**d**”) 90% of the time. The average age of customary production refers to the age at which 51% of children have reached mastery. A summary of Sander’s age of customary production for individual speech sounds is provided in Table 1.

Speech sound acquisition is just the beginning of speech and language skill development. Mastery of speech sounds for verbal communication is the building block to many other essential skills, including appropriate use of pronouns, grammar, phonological awareness, and literacy (Lanza & Flahive, 2012). Having a firm foundation in speech at a young age is important for the continued developmental process (Bauman-Waengler, 2016).

Developmental Speech Sound Disorders

Children frequently experience difficulties correctly producing and placing speech sounds as language is developing. A speech sound disorder may be diagnosed if those difficulties persist past the appropriate age. Speech sound disorder is a broad diagnosis that indicates impairment in a child’s speech (ASHA, n.d.b.).

Table 1

Typical Age of Speech Sound Development

Speech Sound	Age of Production	Age of Mastery
“p, m, h, n, w”	1.5	3
“b"	1.5	4
“k, g, d”	2	4
“t, ng”	2	6
“f, y”	2.5	4
“r, l”	3	6
“s"	3	8
“ch, sh”	3.5	7
“z"	3.5	8
“j”	4	7
“v"	4	8
voiceless “th” (“path”)	4.5	7
voiced “th” (“that”)	5	8
“zh”	6	8.5

As outlined by Sander (1972).

Speech has two components: form and function. Form is the physical ability to correctly produce phonemes. If those phonemes are changed, displaced in, or left out of a word, the meaning, or function, of the speech is changed (Bauman-Waengler, 2016). Speech sound disorders can be further broken down into articulation or phonological disorders. This is based on whether the underlying cause of the impairment is a disorder of form or function.

Articulation and phonological disorders differ in their manifestation, but both negatively impact intelligibility of speech.

Articulation disorders. Articulation disorders are disorders of the form of speech. They result from difficulties placing the physical structures needed to produce certain sounds in the right place and shape, causing those sounds to be produced incorrectly or not at all (ASHA, n.d.b). Some articulation difficulties have no known causes. These may be referred to as functional speech disorders or functional articulation disorders (Bowen, 2011). Other articulation difficulties may manifest for known reasons. These may include malformation of the oral mechanisms as a result of genetic disorders such as cerebral palsy, Down Syndrome, or craniofacial anomalies, and neurologic impairments such as childhood apraxia of speech (Bauman-Waengler, 2016).

Because articulation disorders are motor based, speech errors due to misarticulating are generally consistent across productions of the sound regardless of the placement in the word (Bauman-Waengler, 2016). There are often no noticeable patterns to articulation errors and the errors tend to occur in a small number of sounds. Articulation disorders are characterized by four different speech sound errors: omissions, additions, substitutions, and distortions (Daymut, 2009). Omissions are when entire speech sounds are removed from words (i.e., "pay on the payground" for "play on the playground"). Conversely, speech sounds can be added to words as additions (i.e.,"buh-lack" for "black"). Substitutions are the replacement of one speech sound with another (i.e., "wabbit" for "rabbit"). Distortions are errors in which nothing is left out, added, or substituted, but the sound still is not produced accurately. A child may exhibit one or several different errors that affect their intelligibility of speech (Daymut, 2009).

Phonological disorders. Whereas articulation disorders are disorders of form, phonological disorders are disorders of function. Although phonological disorders are a subset of speech disorders, they are rooted in linguistic processes. Individuals with phonological disorders have the physical ability to produce speech sounds, but use them inaccurately when putting words together to convey meaning. The cause of phonologically-based speech sound disorders is unknown (Bauman-Waengler, 2016).

Phonological disorders are characterized by patterns of speech errors. Some of these errors manifest similarly to errors of articulation, making diagnosing the underlying cause complicated. One way to distinguish the cause of the errors is by looking at the number of errors themselves (Bauman-Waengler, 2016). Because errors occur in speech patterns, phonological impairments generally result in a greater number of errors across different phonemes. The client may also be able to correctly use the phoneme in different word placement. The many different possible phonological process errors that can occur fall under the categories of substitution, assimilation, or syllable structure. A few examples include substituting speech sounds produced at the back of the mouth for speech sounds produced at the front (fronting; /t/ for /k/) or vice versa (backing; /k/ for /t/), assimilating one consonant sound in the word for all consonants (assimilation; “bub” for “bus”), removing the first consonant in a word (initial consonant deletion; “uck” for “duck”), and reducing adjacent consonants to a single consonant (cluster reduction; “pane” for “plane”). A child with a phonological disorder may experience difficulties with more than one process (Bauman-Waengler, 2016).

Speech-Language Pathology Interventions for Children with SSDs

Braumbaugh and Smit (2012) conducted a survey of 489 SLPs registered through ASHA working with pre-elementary school populations. The survey involved several different questions, including the interventions they used most frequently for treatment or children with SSDs. Of the 366 SLPs that completed this portion of the survey, 96% indicated the use of the traditional articulation intervention. Additionally, 96% indicated the use of minimal pairs contrast therapy.

Traditional-motor intervention. In the past, all speech sound disorders were treated as disorders of articulation. The manner of treatment used focused on teaching clients how to correctly use the physical structures used for speech production (i.e., tongue, lips, teeth) to articulate the desired speech sounds (Baker, 2010). This is referred to as the traditional-motor approach and is one of the methods still used for the treatment of articulation disorders (Bauman-Waengler, 2016).

There are many different methods used within the traditional motor approach based on specific client abilities and needs. There is, however, a general treatment outline that clinicians work off of, as described by Bauman-Waengler (2016). The first step in this outline is called sensory-perceptual training, or ear training. In this step, the SLP may use a number of training techniques to help the client hear the difference between specific speech sounds. Not all clients need this initial step and its inclusion is at the discretion of the speech language therapist. Considerations for the appropriateness of sensory-perception training are based on the client's current ability to differentiate between the target sound and other speech sounds, age, and understanding of metalinguistic concepts.

Next, the therapist tries to elicit the production of the target speech sound in isolation. The goal of this phase of treatment is for the client to accurately produce the speech sound outside the context of a word. This can sometimes be accomplished fairly quickly (five to ten minutes). Other times, clients need more assistance. One way to address this area includes having the client imitate the production of the sound when demonstrated by the SLP. The SLP may need to further instruct the client in by telling him/her where to place the articulators in order to produce the appropriate sound. The SLP may choose to use a sound that is very close to the target sound as a starting point and instruct adjustments accordingly.

Once the consonant is stable in isolation, clients can begin to work on the sound when placed in context of different vowels. This can be done with nonsense syllables. These syllables can be arranged so the target sound is in the initial (consonant + vowel), lateral (vowel + consonant), and/or medial positions (vowel + consonant + vowel). The vowels selected can be informed by their articulatory similarity to the target sound.

Although nonsense syllables can have many benefits, clinicians may decide to skip this step and go straight to using functional words. The complexity of the functional word is determined by the: (a) length, (b) syllable structure, (c) position of the sound in the word, (d) the syllable stress of the target sound, (e) articulatory similarities of neighboring sounds, and (f) the child's familiarity with the word. The complexity of the word can increase as the speech sound becomes more stable.

As the sound becomes more stable, the SLP provides opportunities for clients to practice the sound within the context of short, structured phrases and sentences. The easiest way to begin is by using a carrier phrase where the word with the target sound in placed at the very end of the phrase. Carrier phrases can also include the sound in an earlier word. The

experiences should become less structured and include more complex words throughout this phase of treatment.

Finally, the client should be monitored both in and out of the session to observe the production of the speech sound spontaneously. The SLP creates situations in which the client can use the sound in conversations. Teachers and parents are also asked to listen for the sound in the child's everyday speech. The therapist should monitor the production of the sound in the outside setting as well. A re-evaluation and a discussion of continuation of services follows (Bauman-Waengler, 2016).

Minimal pairs contrast therapy. The understanding that speech sound errors can have different underlying causes led to differentiation of treatment protocol for articulation and phonological disorders in the 1970s (Braumbaugh & Smit, 2013). Whereas treatment of articulation disorders focuses on the speech sound in isolation, phonological interventions begin in the context of words (Bauman-Waengler, 2016).

While there are many different intervention options, one of the more frequently used is minimal pair contrast therapy (Baker, 2010). This therapy utilizes words that differ by a single phoneme to help a child with a phonological disorder learn and practice the difference in the sound and meaning of the words. In minimal pair contrast therapy, the words chosen for treatment differ by only one phoneme. The placement of those phonemes in the word depends on the specific pattern of error (Bauman-Waengler, 2016).

There are several different kinds of minimal pair contrast therapies, including minimal oppositions contrast therapy, maximal oppositions contrast therapy, and multiple oppositions contrast therapy (American Speech-Language-Hearing Association, n.d.b). The term opposition refers to the level of differences between the phonemes being targeted in

regards to place, manner, and voicing (Bauman-Waengler, 2016). Place refers to the location of the sound articulation in the oral structure. These characteristics include labial, dental, alveolar, post alveolar, palatal, velar, and glottal. Manner refers to how the sound is articulated. These characteristics include stop-plosives, fricatives, affricates, nasals, liquids, and glides. Finally, consonants can either be voiced or unvoiced (Howell and Dean, 1997, as cited in Bauman-Waengler, 2016). The different levels of contrast utilized are chosen by SLPs based on the number and types of errors (Bauman-Waengler, 2016).

Baker (2010) completed a systematic review of 48 research studies published in peer-reviewed journals that used minimal pair contrast therapy with minimal oppositions as an intervention for children with speech sound disorders. She found that the average age of clients in the studies were between 4 and 5-years-old and exhibited phonological impairment of production of consonants, vowels, words, and/or syllable shapes within words. This protocol appears to be most appropriate for children who exhibit few, consistent patterns in speech sound errors.

There are two different minimal pair contrast therapy protocols as outlined by Baker (2010): meaningful minimal pair intervention and perception-production minimal pair intervention. Both begin with familiarization with the target words, where the SLP demonstrates the words for the client and put them in context to show the difference in their meaning. The next step is sometimes referred to as “picking up.” In this step, the child begins to learn the target sounds by correctly identifying pictures of words including the sounds when the speech language therapist speaks the words.

In the meaningful minimal pair intervention, the child goes from “picking up” to word production. The client is asked to instruct the therapist which picture to pick up. The

therapist provides feedback on both the correct and incorrect pronunciation of the word. Perceptual-production minimal pair intervention adds the steps of word imitation and independent naming before reaching word production level. In word imitation, the child is asked to repeat the target words after the therapist. When the child masters imitation, the therapist asks them to independently name each picture without a model. The child then moves on to word production. The therapist provides feedback through each step in both protocols.

Summary. Articulation disorders and phonological disorders now have different treatment methods (Baker, 2010). One method used to treat articulation disorders is the traditional/motor approach (Braumbaugh and Smit, 2012). The basic protocol for this approach is the same, although there are different ways for SLPs to use it (Bauman-Waengler, 2016). A method that is frequently used in the treatment of phonological disorders in minimal pairs contrast therapy (Braumbaugh and Smit, 2012). Several different protocols and levels of contrast have stemmed from this treatment, but the general tenants of this therapy are the same throughout these variations (Bauman-Waengler, 2016).

Speech, Language, and Music

Shared characteristics. As discussed by McMullen and Saffran (2004), language and music share many characteristics. First, they are both organized temporally, existing in time. The pitch of both speech and music are produced and registered as frequencies. Additionally, language and music both convey meaning through different combinations of a limited number of sounds that influenced by an individual's culture (phonemes and tones/scales, respectively).

Other key characteristics of both speech and music include rhythm, stress, intonation, phrasing, contour, and prosody (Cohen, 1997; McMullen & Saffran, 2004). McMullen and Saffran (2004) suggest the similarities between speech and music may be most evident in early development. Young infants have not yet acquired the ability to use either linguistic or musical systems to communicate and therefor may not separate the two developmentally. Just as infants are able to differentiate between similar speech sounds between 6 and 8 months (Werker & Tees, 2005), infants as young as 8 months old are able to detect changes in distinct changes in a melodic line, regardless of whether or not that change fits within the harmonic structure of the song (Trainor & Trehub, 2002, as cited in McMullen & Saffran, 2004,). By the age of four, children's responses to unfamiliar music begin to show preferences for their typical cultural structure, for example, Western tonal harmony and scales (McMullen & Saffran, 2004).

Music, speech, and the brain. As neuroimaging techniques developed over the past century, so did a relationship between neuroscience and music therapy. According to de l'Etoile and Lagasse (2013), music has been used as a flexible stimulus for neuroscientific research and has played an integral role in understanding how the brain functions. Concurrently, neuroscience has provided the scientific underpinnings for music as therapy, establishing what de l'Etoile and Lagasse call "two critical findings" (p. 10). The first is that music activates areas of the brain that are used for other non-musical functions, the second that learning music causes changes in the brain.

The neurologic relationship between music, speech, and language is ongoing. Some research suggests speech and music utilize some of the same neural pathways. Overlap has been found between speech and singing in the areas of phonological processing

(sensory/input) and production (motor/output) in music education majors (Brown, Martinez, & Parson, 2006). Özdemir, Norton, and Schlaug (2006) also found significant neural overlap in speaking and singing two word phrases.

Despite this overlap, it is also known that music is less localized than speech (Baker & Tamplin, 2006). Speech abilities are impaired when neural signals in the left hemisphere are disrupted, but singing is not affected when signals are disrupted in the left hemisphere (Stewart, Walsh, Frith, & Rothwell, 2001, as cited in Thaut, 2005). This suggests neural areas associated with singing are more widely distributed than those associated with speaking and help explain why individuals with damage to the language centers of the brain are able to sing if they cannot speak. Jeffries et al (2003) supported this conclusion by showing the different brain areas activated by both speaking and singing using positron emission tomography (PET). Speaking elicited activity in the primary language centers of the left hemisphere (Broca's area, Wernicke's area, planum temporale). While some of the homologous areas in the right hemisphere were active during the singing intervention, the PET scan also showed activation in areas of the right temporal lobe and prefrontal cortex that are not associated with spoken language in the left hemisphere as well as areas in both the right and left hemispheres associated with emotion and memory. Specific neuroimaging studies have pinpointed additional areas of activation in the right temporal lobe, primary sensorimotor cortex, and several other structures when words are sung rather than spoken (Özdemir, Norton, and Schlaug, 2006).

Music Therapy and Childhood Communication Disorders

Research regarding music therapy and developmental speech sound disorders is extremely limited. A search for literature revealed that many of the existent studies are well

outdated and include an unspecific diagnoses of speech delay that may not align with current diagnostic criteria (Harding, 1982; Hoskins, 1988; Lathom, Edson, & Toombs, 1965; Seybold, 1971; Zoller, 1991). Most of the recently published research on music therapy and children with speech and language disorders involves the use of Neurologic Music Therapy (NMT) techniques.

NMT and childhood acquired communication disorders. A large portion of the recent research on music therapy and children with speech and language disorders stems from rehabilitation of children with acquired communication disorders. Kennelly, Hamilton, and Cross (2001) used the NMT technique music speech stimulation (MUS STIM) in combined music and speech-language therapy sessions to prompt word retrieval in a 3-year-old girl with severe Broca's aphasia. MUS STIM prompts clients to retrieve words when they are purposefully left out of musical phrases by the therapist. The authors stated the client was verbally indicating music preferences and singing sets of lyrics in their entirety at the time treatment was terminated. The client's parents also reported a transfer of skills to her everyday life, providing anecdotal evidence of verbal interactions with friends and family.

Bower and Shoemark (2009) showed the benefits of the NMT technique rhythmic speech cuing (RSC) with a 10-year-old boy who presented with word retrieval problems and impaired intelligibility of speech due to speech-motor deficits following a global acquired brain injury. RSC involves rhythmically chanting phrases while varying the stress patterns to communicate different meanings (Baker & Tamplin, 2006). It has also been modified to employ songs that focus on the specific words and speech sounds the client is working toward (Kennelly, 2013). The authors concluded RSC was beneficial to the client, who was

able to engage in simple verbal dialogues in everyday conversation at the time of discharge from the hospital (Bower & Shoemark, 2009).

Another neurologic music therapy technique that has been used with children with acquired speech and language disorders is modified melodic intonation therapy (MMIT) (Kennelly, 2013). Adapted by music therapists from the original 1970s protocol to include more musical structure to facilitate functional speech, MMIT begins with the singing of familiar songs with the child to help encourage the use of his/her voice. The music therapist then begins to include composed functional musical phrases based on simple melodies and harmonies. The melodic and harmonic material of each phrase should be distinct to prevent confusion and the rhythm should match the rhythm of the words when they are spoken. The target words should be placed at the very end of the phrase, as in music speech stimulation and rhythmic speech cuing. The child is asked first to listen, then to join in singing the phrases with the music therapist. The music therapist slowly reduces her participation until the client is singing the phrases on his/her own. The goal is for the client to be able to respond using conversational speech rather than singing.

NMT and childhood developmental communication disorders. Neurologic Music Therapy research has also been conducted with children with developmental communication disorders. Modified melodic intonation therapy has also been investigated in treatment of children with developmental speech and language disorders. Lagasse (2012) conducted a study using MMIT with two boys, ages five and six, with developmental apraxia of speech. Each client attended five speech language pathology sessions and four music therapy sessions with MMIT in alternation over a period of four weeks. A pre-test/posttest design was utilized to measure articulatory control. Posttests were administered following each

therapy session to compare results. The author found that, while there was a slight improvement in the speech production test scores from the first to final music therapy sessions and one client showed greater articulatory accuracy following music therapy, the overall pretest to posttest scores of both clients were not statistically significant. This suggests MMIT may not be an effective treatment for children with developmental apraxia of speech.

One Neurologic Music Therapy technique has been created specifically to target speech and language training in children with developmental disorders. Developmental speech and language training through music (DSLM) emphasizes the use of musical material that is developmentally appropriate for children to encourage speech production and/or language acquisition (Lagasse, 2014). This intervention is designed to work with children with developmental apraxia of speech, autism spectrum disorders, cerebral palsy, intellectual disabilities, and/or specific language impairments. The overall goal of DSLM is to improve the functional use of communication.

Lagasse (2014) provided an overview of DSLM for music therapists working with children with developmental speech and language disorders. The approach of this overview emphasized the use of the transformational design model (TDM) for neurologic music therapy practice. The TDM was developed as a way for music therapists to use a rational, scientific model as the basis for treatment design and clinical practice by Thaut (2005). The most recently published outline of the TDM consists of six steps: (1) complete a diagnostic and clinical assessment of the client, (2) develop goals and objectives to be addressed in therapy, (3) design nonmusical exercises and stimuli to address those goals and objectives, (4) translate the exercises and stimuli designed in step three to therapeutic music experiences,

(5) reassess the outcomes of the therapeutic music experiences, and (6) generalize acquired skills to functional applications for daily living (Thaut, 2014). Although developed with all neurologic music therapy practices in mind, the TDM is a particularly appropriate outline for the development of DSLM exercises because it is impossible to encompass treatment for all areas of speech and language disorders in one definitive protocol (Lagasse, 2014).

Very few research articles using DSLM have been published in the music therapy literature. In one study, Lim (2010) used DSLM with therapist-composed songs to test levels of speech production in 50 preschool age children with autism spectrum disorder (ASD). The participants were randomly assigned to music, speech, or no-training conditions. A pre-/posttest design was used to assess the acquisition of 36 functional words appropriate for the clients' ages through each of the conditions. Participants in the music condition watched a video recording of six therapist-composed songs that included all of the functional words being tested. Participants in the speech condition watched a video with the song lyrics spoken as a story. Those in the control condition did not watch any videos. The videos were shown twice a day for three days before the posttest was administered. Results indicated statistically significant improvements of the use of age appropriate functional words within both the music and speech conditions, but the difference between the two conditions was insignificant. Further analysis indicated clients at a lower level of functioning who were in the music condition improved their speech production significantly more than those in the speech condition. This study suggests that DSLM training through music therapist-composed songs is more beneficial that speech training for children with ASD who are low functioning.

The only other research study on DSLM is published by Lagasse (2011). She presented a case study on the use of DLSM and rhythmic speech cuing with a 6 year-old boy

with Down syndrome. At assessment, the client produced four initial phonemes in words. He also used sign language to communicate the names of family members and favorite foods. DSLM was used to address articulation of phonemes, intelligibility of speech, the development of want/need statements, and receptive language skills. The author described the use of a metronome set to the client's arousal level that acted as a stimulus for the production of speech throughout the music therapy session. Singing and therapist-composed songs were used frequently in the sessions. The music therapist and client would play instruments such as the drum while singing "ba, ba, ba, ball" to practice articulation of specific phonemes (p. 172). The music therapist also used songs and singing to work on greetings, vocabulary, and spatial concepts. She modeled an example response within the song or phrase, setting up musical and rhythmic cues to encourage the client's response. The client was eventually able to cue speech himself with rhythmic tapping on his leg and rhythmic signing. Language and vocabulary were further explored by client-directed play in which the music therapist adapted song lyrics to include whatever action the client was doing in the moment (i.e., rolling the ball). At the end of the sessions, the therapist engaged the client in speech using the concepts addressed to generalize the musical interventions to real-world experiences. After a year of receiving services, the client was able to intelligibly speak more than ten functional phrases. He was also beginning to recognize letters and learn new words by sounding them out when they were written. Phonemes in the initial and middle positions of words were largely intelligible and skills to place phonemes in the final position were emerging. The client also demonstrated and increased vocabulary in both signed and spoken language. This case study suggests DSLM and rhythmic speech cuing are successful interventions for articulation, vocabulary, and functional phrases.

In addition to her research, Lagasse (2014) provided several examples of DSLM to address speech sequencing, phoneme acquisition and intelligibility, pre-linguistic language behaviors, semantic learning, the use of alternative and assistive communication (AAC), and receptive language skills of children with speech and language difficulties. While the author included references to populations that typically demonstrate a need for each of these goals, she indicated these experiences are not limited to those specific populations. These examples may be helpful to the music therapist working with children with developmental speech sound disorders.

Summary. Recent research suggests a Neurologic Music Therapy focus for treatment of both acquired and developmental childhood speech and language disorders. Some of the neurologic music therapy techniques that have proven beneficial in pediatric rehabilitation include music speech stimulation (Kennelly, Hamilton, & Cross, 2001), rhythmic speech cuing (Bower & Shoemark, 2009; Kennelly, 2013), and modified melodic intonation therapy (Kennelly, 2013). These techniques may not be beneficial for children with developmental speech and language disorders (Lagasse, 2012). Developmental speech and language training through music, however, provides a successful framework for music therapists working with children with developmental speech and language needs (Lagasse, 2011; Lagasse, 2014; Lim, 2010; Thaut, 2005).

Chapter 3

Method

Songwriting in Music Therapy

Following the transformational design model of Neurologic Music Therapy and the principles of developmental speech and language training through music, music therapists should be able to construct musical experiences derived from nonmusical interventions in the field of speech language pathology to work with this population. As presented in Chapter 2, the available literature suggests original song compositions are an effective way to adapt nonmusical interventions in music therapy (Lagasse, 2011; Lagasse, 2014; Lim, 2010; Thaut, 2005).

According to Brunk (1990), music therapists use three different types of songwriting in their clinical practice: process, spot, and strategic. Process songwriting refers to music that is composed with a client or clients. The focus is usually on the therapeutic value of the songwriting process rather than the finished product. Process songwriting may also be called therapeutic songwriting and is the most common type of songwriting documented in music therapy literature (Jones, 2006). Spot songwriting is a technique used to write songs with clients quickly based on a topic, words or phrases, and harmonic material they would like to include (Brunk, 1990). This can be done in a fill-in-the-blank format, to a predetermined chord progression, or completely composed in the moment.

Strategic songwriting refers to therapist-composed songs prepared in advance of the session to directly address client goals (Brunk, 1990). Jones (2006) conducted a survey on music therapists' use of strategically composed songs. Of the 302 music therapists surveyed, 73% said they use originally composed songs in their clinical practice. Music therapists

working with children and adolescents utilized original compositions significantly more frequently than those working with adults. The results indicated the majority of these songs were used in school settings, including preschool and early intervention, and with individuals with developmental disabilities. Compositions most frequently targeted social-emotional and academic-cognitive goals, followed by behavioral attention to task, social-communication, speech-communication, multiple goal areas, social interaction, and physical movement goals. The style of the songs was influenced most by the style the client preferred, as well as the music therapists' musical skills. Music therapists surveyed said they used strategically composed songs because they were more individualized to the clients.

Brunk (1990) discussed the many aspects that need to be considered when composing an original song for therapeutic use. First, the music therapist needs to consider the goals she is trying to address. This decision will influence the lyrics and length of the song. Once the goals are determined, the song structure, or form, needs to be selected. Minimizing this to a few simple, easily remembered phrases may be better for working with children than writing an entire verse and chorus. There should also be an even number of phrases to best promote memorization and comprehension. Further determination of the structure will depend on the specific strengths and needs of the client (Brunk, 1990). For example, if a child is motivated by singing, but needs to address receptive language skills, a call and response format may be therapeutically appropriate.

Brunk (1990) also outlined five principles of strategic songwriting for music therapists. The first is to make the contour and rhythm, or prosody, of the melody reflect the rhythm and inflection of the lyrics the same as it would be in normal speech. The second principle is making sure both the harmonic and melodic phrases provide an intuitive space

for the client(s) to respond. This is most frequently at the end of a phrase. Chords that compel a resolution, such as a dominant or secondary dominant chord, create a strong cue for a response. Melodically, a definitive rest or pause in the music can be utilized. Principle three indicates that a song does not have to be finished the first time it is used in a music therapy session, specifically, changes can be made. Principles four and five encourage the music therapist to add interesting harmonies and musical techniques such as suspensions or varying accompaniment patterns to make songs more interesting both for herself and for the client when appropriate.

Song Composition Process for Developmental SSDs

Drawing from the information on the TDM (Thaut, McIntosh, & Hoemberg, 2014; Thaut, 2005), DSLM (Lagasse, 2014; Lagasse, 2011; Lim, 2010; Thaut, 2005), and considerations and principles for strategic songwriting (Brunk, 1990), the current investigator developed the following process for strategic songwriting in music therapy treatment of developmental speech sound disorders:

1. Determine the goals to be addressed as outlined by the child's speech language therapist.
    i. Discuss the underlying cause of the disorder (if known) and the treatment protocol being used in SLP sessions with the SLP. Be clear about the different steps of the protocol.
    ii. Select the target phonemes and words to be used in the song.
2. Determine the length and form of the song.
    i. Take into consideration the child's age and developmental stage when determining the length and complexity of the song.

ii. Arrange the target phonemes and words into functional phrases.

iii. Arrange the phrases according to the step(s) of the SLP treatment protocol.

3. Create a melody for the lyrics.

    i. Consider the child's age and developmental stage to help select the melodic range of the melody. For younger children, research suggests children's vocal range is between middle C and C5, and songs should be placed between D and A above middle C (Buckton, 1977; Flowers & Dunne-Sousa, 1990; Moore, 1991, as cited in Kim, 2000).

    ii. Have the contour of the melody line follow the natural prosody of the words when spoken.

    iii. Create opportunities for clients to respond in the manner appropriate as outlined in the treatment protocol (i.e., a step involving imitation would suggest a call-and-response format, whereas a step involving functional speech production would suggest a fill-in-the-blank format). Be sure these opportunities occur at a natural location, such as the end of a phrase.

4. Create a harmonic progression for the song.

    i. Take the child's age, developmental stage, and stylistic preferences into consideration when selecting and arranging chords in the song.

    ii. Utilize dominant (V7) and secondary dominant (V7/V) chords in the appropriate locations to further encourage client responses.

    iii. Consider the client's preferences when selecting the accompanying instrument and accompaniment style.

    iv. If appropriate, add harmonic variations to help maintain client interest.

5. Use the song in treatment and make changes as necessary.
    i. Each client has different strengths and needs. Adaptations and modifications may need to be made in order for the client to be successful in the experience.

Following this outline, the investigator adapted two treatment protocols from the field of speech language pathology to inform her songwriting practice for treatment of children with developmental speech sound disorders: a) traditional/motor approach for the treatment of articulation disorders, and b) minimal pairs contrast therapy for the treatment of phonological disorders.

Materials

Target speech therapy goals for the composed songs were taken from SLP treatment example descriptions and video supplements in educational texts in the field of Communication Sciences and Disorders (CSD). The client description for the traditional/motor approach treatment was selected from *Articulation and Phonology in Speech Sound Disorders: A Clinical Focus, (5th Ed.)* by Bauman-Waengler (2016). The protocol the investigator utilized for this treatment is as outlined by Bauman-Waengler (2016). The reference video for minimal pairs contrast therapy was taken from *Interventions for Speech Sound Disorders in Children* edited by Williams, McLeod, and McCauly (Arnold, 2010). The minimal pairs contrast therapy protocol was utilized as described by Baker (2012). A CSD professor at the investigator's university recommended these resources.

Process of Notating and Recording the Songs

Following the composition of each song, the investigator notated each song using the music notation software Finale (MakeMusic, Inc, 2013). The notation included the melody, lyrics, and chord symbols for the songs. Finally, the songs were recorded by the investigator

on recording software Garage Band (Apple, Inc., 2011) and saved onto a compact disk (CD) with the help of a music industry recording and production major at the investigator's university. The notation and discussion of each song is presented in Chapter 4 of this thesis.

Chapter 4

Songs

"Fish Feet"

Client description. Aiden is a 3-year-old boy who has an articulation-based speech sound disorder. He is currently working on the production of /f/ in the initial position for which he either omits the sound entirely or substitutes /p/ (Bauman-Waengler, 2016). Aiden's SLP has used the traditional motor approach to address the sound production in isolation. She is now working on helping Aiden transfer those skills into the context of functional speech through nonsense syllables and one-syllable word production. He frequently produces the initial /f/ correctly on the word "fish," but is still having difficulty with other words. The music therapist has been asked to provide opportunities for Aiden to practice these skills during his MT sessions.

Explanation of songwriting process. Figure 1 displays the song composed for this client entitled "Fish Feet." The present investigator began the songwriting process by making a list of words Aiden is working on with his speech therapist. The words selected were all single-syllable words with an initial "consonant-vowel" ("CV") format: food, feet, fox, face, fire, and fast. Because Aiden accurately produces the word "fish," the investigator chose to include that word in the song as a model for other words that begin with /f/. The words were first arranged into functional sentences, with the target word placed at the end. The investigator then chose phrases that would go together in the context of a song or story that is appropriate for Aiden's age. The target words selected after this process were "feet," and "fast." The nonsense syllables "fee" and "fo" were chosen to lead into the target word "feet"

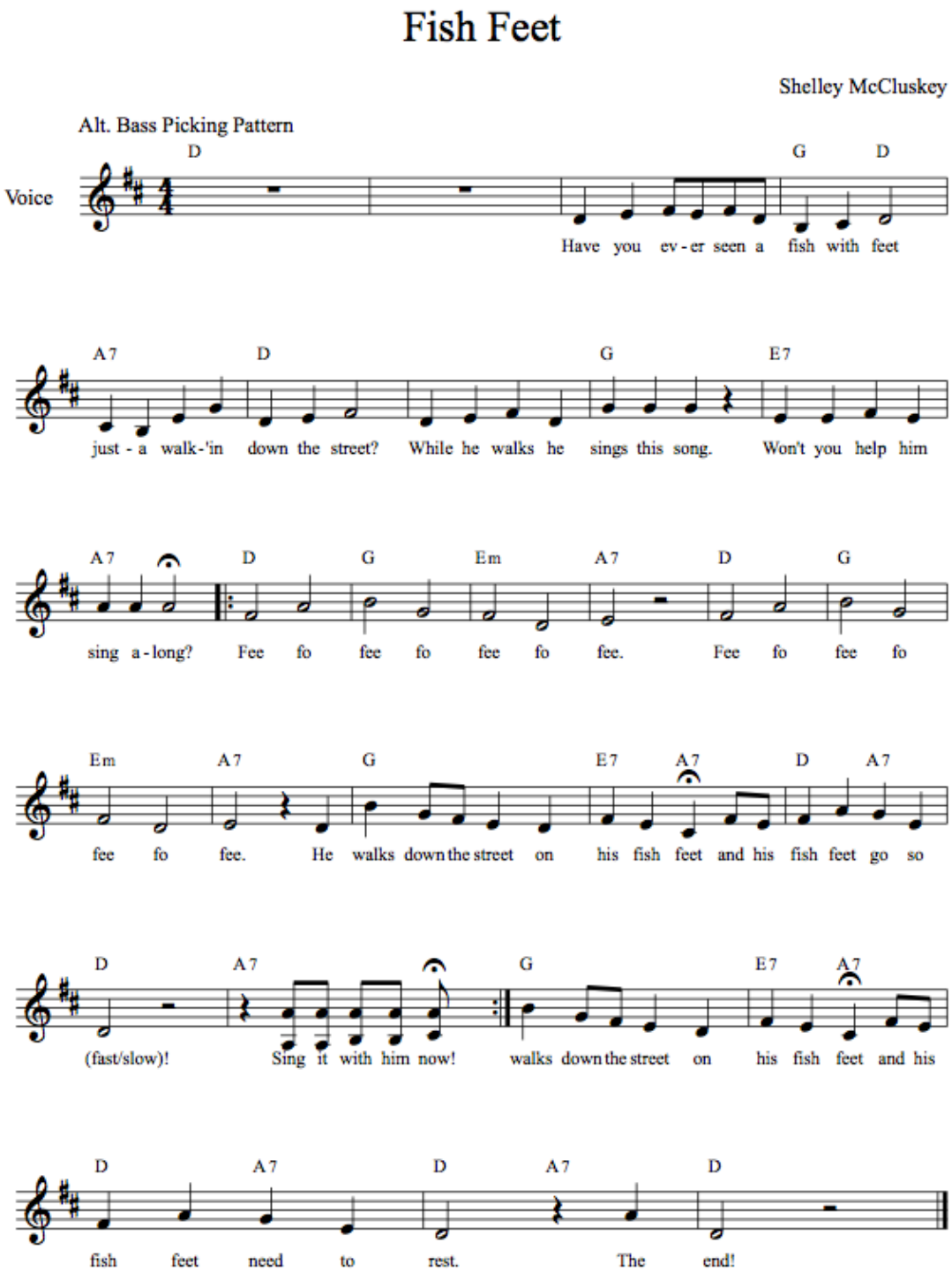


Figure 1. Example song composed for music therapy treatment of articulation-based SSD.

while providing opportunities for multiple vowels to be practiced ("fo," "fi," and "fah") within the context of the song.

The range chosen was between C#4 and B4, centering mostly between D4 and A4. The key of D was chosen for its inclusion of these pitches. The investigator determined the contour of the melody by asking friends and family to speak the phrases written on a piece of paper. The form of the song is a repeated chorus with an introduction to place the target words in a context. The chorus provides opportunities both melodically and harmonically for Aiden to fill-in-the-blank with the target vocabulary words. The addition of the Em chord in the chorus serves to add harmonic interest to the song for sustained attention. The alternating baseline was chosen stylistically to match the alternating nonsense syllables, as well as mimic a walking gate in the context of the song.

Adaptations, modifications, variations. Changes may need to be made to songs based on the clients' specific needs. Movement, such as walking, or instrument play could be incorporated during the nonsense syllable portion of the song to further assist with the anticipation, preparation, and production of /f/. The alternating bass accompaniment could also be changed to a strumming pattern to encourage and support the airflow that differentiates this sound from /p/. The therapist has the ability to choose the tempo of the song by selecting "fast" or "slow" if they believe a certain tempo would better help with the production. As accurate production increases, the music therapist can leave out target words in the middle of the phrase in addition to those at the end in order to promote generalization to functional speech. This song would be contraindicated for children with a language impairment who are working to improve grammar and syntax as grammar was not the primary focus during composition. Additionally, this song may need to be modified for

children with distortions as the line "Just-a walkin' down the street" may reinforce that sound error.

"At the Beach"

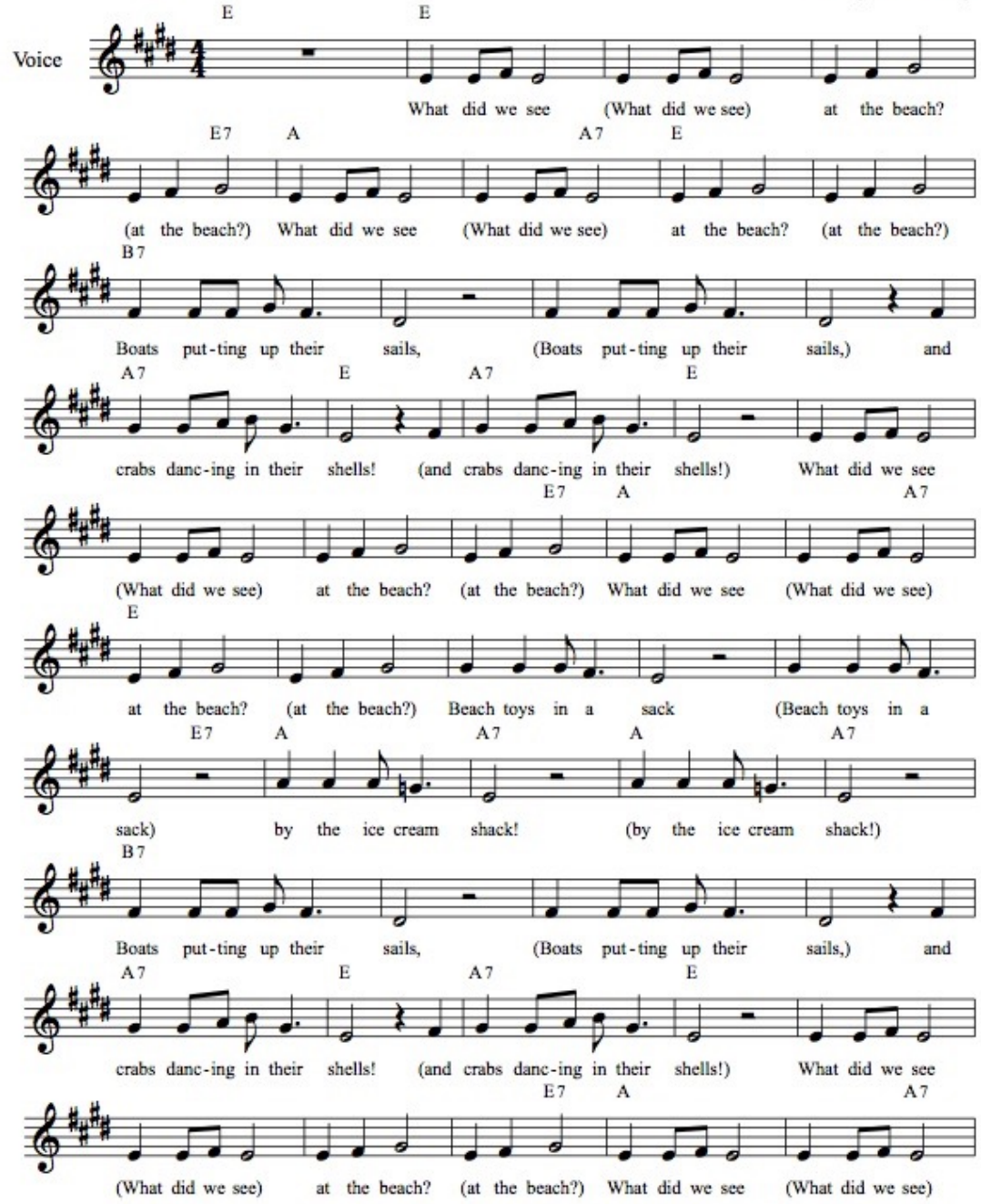
Client description. Evan is a 5-year-old boy who has a mild phonological disorder. His SLP is using semantic confusion in minimal pair intervention to help him distinguish between the speech sounds /s/ and /sh/. Evan is also learning to produce these sounds accurately. The SLP describes /s/ as the "flat tire sound," and /sh/ as the "quiet lady sound." Some of the word pairs being used are "see/she," "sew/show," "sail/shell," "sack/shack," and "Sue/shoe" (Arnold, 2010). The music therapist has been asked to provide opportunities for Evan to practice these skills during his MT sessions.

Explanation of songwriting process. Figure 2 displays the song written for this client entitled "At the Beach." The investigator selected words from those used by the SLP that could be placed together in a functional context because an important part of treatment for phonological disorders is understanding the difference in meaning behind the words. The words selected were "sail/shell," "sack/shack," and "Sue/shoe." Opportunities to say "see" were also provided without a word pair. The target words were arranged at the end of functional phrases.

The range of this song is D#4 to A4 in the key of E major. The contour of the melody line was again determined from the investigator asking friends and family to speak the phrases written on a piece of paper. Some specific examples of this include the melody line going up at questions. The form of this song is slightly longer than that of the previous song due to the increase in age and developmental capabilities. An echo, or "repeat-after-me" format was selected based on the imitation used in minimal pairs contrast therapy protocol.

At the Beach

Shelley McCluskey



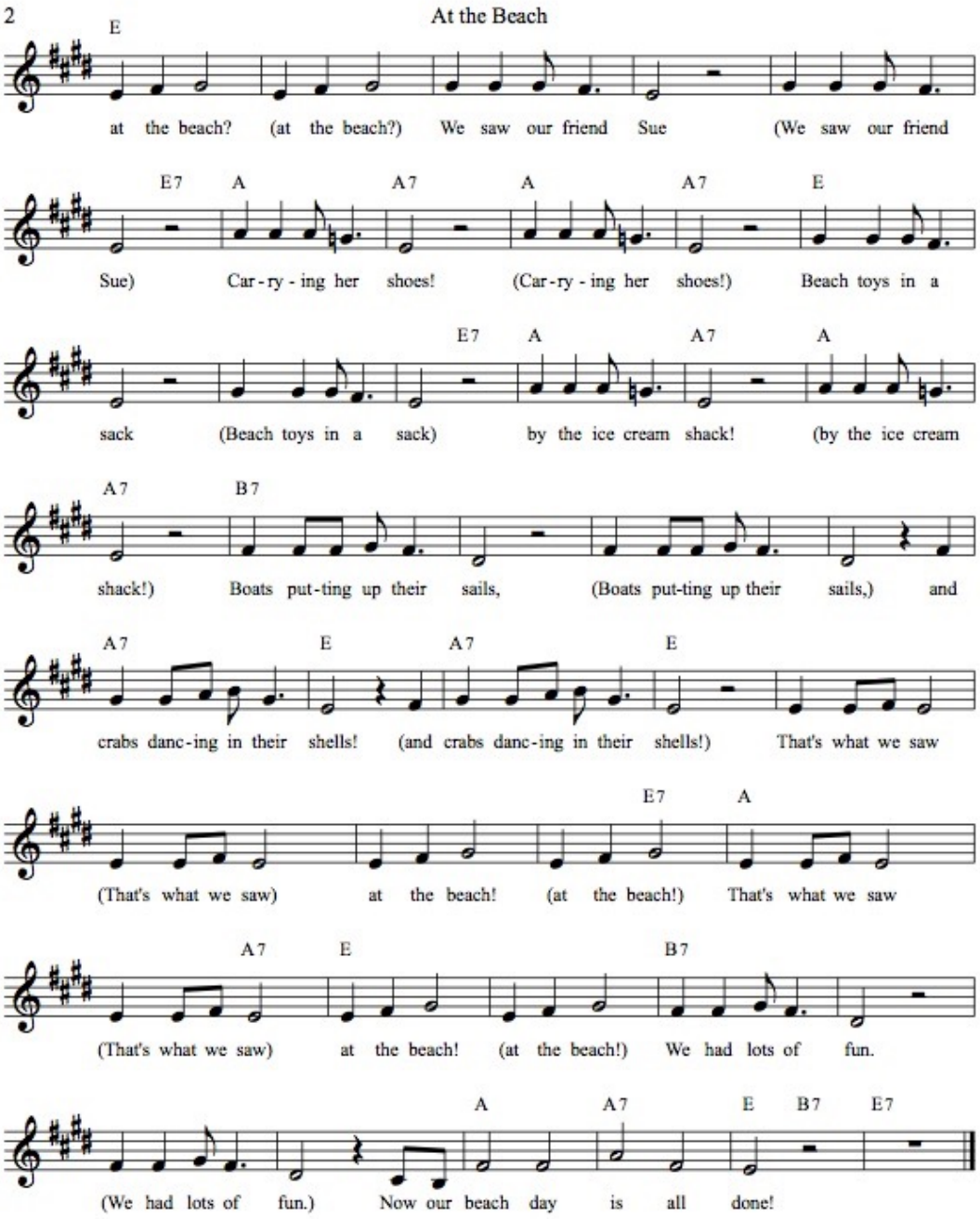


Figure 2. Example song composed for music therapy treatment of a phonologically-based developmental SSD.

The verses build on one another to allow multiple opportunities for practice of each word pair. A blues progression was selected for this song because of its repeated structure and the natural addition of seventh chords at the end of phrases.

Adaptations, modifications, variations. Changes can be made to this song based on the client's needs. One adaptation would be the length of the song. The additional lines to each verse could be added gradually across several sessions. This may be beneficial if the client needs more individualized practice with each sound or if the song is too long for attention purposes. In order to help with language recognition and increased understanding of word meaning, pictures or movements to go with each of the target words could be used. One variation of this song that could be used during the next step of minimal pairs contrast therapy would be to have the client sing the initial phrase and the therapist echo. This song may be contraindicated for children whose treatment is also targeting grammar and syntax as those were not the primary focus of this song.

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Vita

Shelley McCluskey was born in Greensboro, NC. She is the daughter of Thomas and Catherine McCluskey. She grew up in the town of Mount Airy, NC. Upon graduating from high school, Shelley began a bachelor's degree in music therapy at Appalachian State University in Boone, North Carolina as a member of the honors program. Shelley has been active in a variety of organizations throughout her college career, holding multiple offices in Sigma Alpha Iota and the Appalachian Music Therapy Student Association, as well as volunteering with the Scholars with Diverse Abilities Program.

As part of the requirements for the Bachelor of Music in Music Therapy degree, Shelley plans to complete a music therapy internship at Children's Healthcare of Atlanta in Atlanta, Georgia. Following graduation, she would like to spend a few years gaining work experience prior to returning to school for a master's degree in music therapy. Shelley also plans to receive the Neurologic Music Therapist designation.