GAIT TRAINER™ 3 (v3.X software)

MUSIC THERAPY

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BIODEX
Biodex Medical Systems, Inc.
20 Ramsey Road, Shirley, New York, 11967-4704, Tel: 800-224-6339 (*Int'l 631-924-9000*), Fax: 631-924-9241, Email: info@biodex.com, www.biodex.com

FN: 19-258 7/19

Use of Music Therapy and the Gait Trainer 3

Introduction to Music Therapy

A relationship between music and healing has been acknowledged as far back as early civilization. The notion that music can influence health and promote healing dates back centuries. The 20th century music therapy discipline began after World War II. Doctors and nurses noted the patients' responses to music and music programs. They then began to set up music plans to help patients regain movement. This occurred in facilities all throughout the country. Over the last 50 years music therapy has gained increasing popularity in the medical field, schools and recreational programs. Today many medical and rehabilitation facilities offer music therapy as one of their treatment modalities.

The idea of a preventive approach to health became popular in the 1970's. Music therapy gained further momentum. The gaining acceptance for the practice and use of music therapy to help with motor function and healing is in part due to the writings of various authors explaining the biological foundations between neuroscience and music therapy. Today there are many approaches to music therapy combined with clinical applications that assist in restoring movement in all populations.

The desired end result for this performance program is directed towards assisting patients in regaining their independence as well as their ability to participate in activities that are important to them. This performance plan utilizes current concepts which link movement and music to help gain neuromuscular control.

Concepts

Rhythmic Auditory Cueing (RAC)

A technique that facilitates movements that are intrinsically rhythmical in a repetitive pattern; such as gait. This technique uses music as an external cue to regulate the body's movement in time and allows patients to become in tune with their own rhythm. It typically occurs during closed-chain gait activities.

Patterned Sensory Enhancement (PSE)

A broader application than RAC as it facilitates movement and movement patterns that are not biologically rhythmical. These movement patterns are incorporated into a series to form functional movement patterns. For example, hand and arm movements for eating, dressing, and other ADLs as well as whole body movements required to shift from a seated to as standing position.

PSE is defined as a technique using rhythmic, melodic, harmonic, and dynamic acoustical elements of music to provide temporal, spatial, and force patterns to structure and to cue functional movements. It typically occurs during open-chain parameters of gait.

Pitches or Octaves

Higher – effects head, upper body alignment, head height
Lower – effects mid trunk
Lowest – effects lower legs and feet

Fitting the Music to the Steps per Minute

1. It is important to complete the majority of the music discussion prior to the beginning of gait training. Typically, the patient will fatigue and the data will not be as accurate during walking while you are attempting to establish preference/context and set up the music.

2. Measure a patient's gait speed - On the initial rehab visit, the therapist can determine the tempo of music to begin the gait training using one of the particular walk tests that apply to the patient's ability (e.g., 6 MWT, 6 meter walk test). Lower level patients can ambulate for 15 seconds with the therapist counting each heel strike and multiplying the total by four. The total number will be steps per minute (spm). Initially, the tempo of music should be a few beats slower than the initial walk test.
3. If the calculated steps per minute from the baseline gait test do not match a preset tempo, adjust the Gait Trainer 3 music bpm first, then the Gait Trainer belt speed to match the Gait Trainer 3 bpm. Use following guidelines to choose a song tempo:
    a. Choose the song tempo that is at or just below patient's baseline spm.
    b. Tempo change the music upward as a general rule during the treatment phase as you do 5%-10% incremental increases.
4. When it is time to start gait training, start with just one gait component heel strike (HS). The goal is for the patient to walk step-over-step bilaterally at the established tempo.
5. Allow the client to walk to this music tempo (bpm) for 3-5 minutes to allow entrainment to occur during treatment phase.

    NOTE: Based on analysis of the person's gait pattern, the therapist will adjust the music (the therapist must get familiar with music library in order to make distinctions in each composition to select the appropriate usage of songs). Ex: orthopedic vs. those with cognitive and severe gait impairments such as Animals Everywhere exercise.

    a. Observe and watch for subtle entrainment:
        1) This will be observed when the person appears to walk naturally to the music in a more relaxed and natural gait pattern. (We use the Histogram screen to observe subtle entrainment patterns.)
        2) Observe and watch for subtle functional corrections or exacerbation of movement issues. Discontinue music playback if exacerbation is observed and return to metronome option until the correct fit of music is determined to improve the person's overall functional movement.

IMPORTANT! *Reassess the person's progress at the next scheduled follow up session. A person who is able to independently ambulate will rehearse per the therapist instructions using the therapist approved music program that is downloaded into a mobile device for personal home use and/or into the treadmill gait training system thumb drive for therapist's and person's use during therapy sessions.*

Animals Everywhere:	PT Terms	Instrument	Auditory Cue	Functional Movement
45-108	Initial Contact/ (heelstrike)	Metronome/Bass Drum	RAC	• Constant music • Facilitates heel strike
45-108 BPM Metronome/Down beat of songs	Initial Contact (heel strike)	Bass guitar	RAC	• A crisp sound with greater force assists with increasing stride length • tends to get people to stroll • At slower movement ranges, it helps with continuity of movement; (helpful with Parkinson's and FOG). • (79,89,108bpm) Can use this beat for gait, but can take a person to ½ time. Helps with increasing stride length and decreasing walking speed. • Cues the patient slow down and take longer steps. • Helps to reset the person's automatic movement ability (once mastered, cue patient to step/walk and increase tempo again).
With 89/108 BPM Piano/Bass together	Step length Weight Shift	Piano /Bass	RAC	• Downbeat to facilitate heel strike and with more force to encourage step height. • Due to the two different alternating notes, weight shifting will be facilitated • Useful with patients with neglect. Unilaterally, PT can cue lead foot to coincide with sensory cue to effected side.
BASS & KEYS created to be on opposite side which helps bilaterally during ambulation				
42-108 BPM	Upper Trunk Mid Swing	Guitar	RAC (PSE provides anticipatory pattern for lift, mild swing)	• Facilitates – trunk rotation and anterior trunk posture for those in extension. – arm swing and initial swing phase of gait cycle. – more a side-to-side movement (makes a person want to swing side-to-side).
45-108BPM	Mid Trunk Initial to Mid Swing	Saxophone	PSE	• Created as a gently wave – relaxing feeling. • Helps with movement initiation. Helpful with patients with FOG. • Pulling sensation at lower walking speeds; for trunk rotation and upward trunk extension • Forward movement and smooth UE swing (especially at slower tempos).
45-108	Posture elevation	Clarinet	PSE	• Higher pitch octave for more trunk elevation. • Pulling sensation. • More UE/spine/height extension than SAX since octave is higher.
45-108	Posterior WS Lower legs midstance	Trombone	PSE	• Facilitates hip/trunk rotation. • Forward smooth momentum with pulling through core and hips. • Ground LE movements.
45-108	Endurance Burst	Mid way 2-3min cues built in emotionally followed clarinet quicken sound		• Helps when person is not moving forward. • Helps provide "extra boost" when person is fatiguing. • It is only used in short bursts not continuous sound and movement. • Monitor patients prone to ambulating with a festinating gait pattern.

Music

Samples from compositions designed for use in Biodex Gait Trainer 3 Systems

Animals Everywhere (gentle forward-pulling sensory experience throughout piece)		
bpm	**Time**	**Activity**
45 bpm		Guitar pattern for leg lift, extension and drum playing down beat for consistent heel strike from beginning through end of song.
	2:08	At 2:08 time mark wind instruments added to provide sensory cue to smooth out movement and cue UE upward postural alignment.
	3:30	Medium enhancement of forward/progressive sensation to music for endurance boost.
	4:15	Musical cue for UE and head floating upward, as well as cue for home stretch to end.
	5:09	Music builds stronger layers of instruments such as bass line for enhanced sense of forward movement, with further smoothing out of movements and overall increase of quality of movement.
57 bpm	0:00 - 0:26	Metronome begins for 15 seconds alone for heel strike. Guitar pattern again, for let lift and extension. Acoustic quality of a march to enhance upward and longer stride.
	2:30	Mark bass line with texture of instrumentation with accent and texture to facilitate rotation.
	3:40	Simple lighter texture quality to music to relax, support endurance.
	4:30	Bass line to support longer stride cue.
	4:53	Music adds eighth notes towards end to support progressive feel at end of song when fatigue can become issue.
72/36 bpm	0:00 - 0:26	Stronger layering of down beat for heel strike and initiation of movement. Use bass line at 36 bpm to open and elongate stride them bring them back to drum/metronome at normal 72 bpm.
	0:53 - 1:05	Use music cues to support increased postural alignment.
	1:20	Sensory patterns to support weight shift and UE Rotation. 4:12 Head floating, body well balance over mid foot.
89/45 bpm	0:00 - 0:21	Bass again at 45 bpm to open stride and with piano/bass combination to provide L/R weight shift cues. Can exaggerate dystonia for patients with strong one side dystonia (i.e., exaggerate a curled arm or upward leg cur use other Animals Everywhere tempo track or Street Walking either tempo range if this happens).
	1:08	Music cues smoothing quality to movement.
	3:20	Increased texturing of instruments to better integrate postural alignment and smoother quality in gait.
108/54 bpm	0:00 - 0:21	Bass again at 45 bpm to open stride and with piano/bass combination to provide L/R weight shift cues. Can exaggerate dystonia for patients with strong one side dystonia (i.e., exaggerate a curled arm or upward leg cur use other Animals Everywhere tempo track or Street Walking either tempo range if this happens).
	1:08	Music cues smoothing quality to movement.
	3:20	Increased texturing of instruments to better integrate postural alignment and smoother quality in gait.

Street Walking		
72 bpm	0:00 - 0:26	Heel strike first.
	1:19	Gentle pushing quality to sensory pattern, builds movement up then backs off and gives anticipatory cues for more complex UE/LE complex coordination.
	2:13	Integrate texture for full hip extension and UE rotation, arm swing. Throughout piece more up/down as well as sideways (rotate/weight shift) enhanced quality for more complex gait movements.
90 bpm		26 Heel strike first. With smooth progression of movements, coordination to integrate hip flexion, rotation, and more open, relaxed natural arm swing.
Silvery Moon Medley		
All Tempos		Simple (RAC) Heel Strike for functional improvements in stride length and symmetry. (PSE) Swing pattern for normalized gait. Only 3 simple instruments, no confusing extra sensory, or over stimulating patterns present.

NOTE: All other songs preloaded in the Gait Trainer 3 systems are meant for use with patients who have mild to moderate gait impairment with mild to no known cognitive or sensory sensitivity issues such as the orthopedic population.

About the Author

Hope Young, MT-BC has been a music therapist for more than 25 years. The Center for Music Therapy was founded in 1990 to make music therapy more accessible to the Central Texas area. She focused on working with children, adolescents, adults and geriatric patients.

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