Rhythm, Music and Movement for Parkinson’s: An Interview with Dr. Concetta Tomaino

The relationship between music and healing has an extensive history, dating back to early civilizations. Today, music interventions are gaining momentum in both research and clinical observation for helping to restore movement in a variety of patient populations.

To understand how music can affect movement in people living with a neurologic disorder like Parkinson’s, we asked an expert. Dr. Concetta Tomaino is the Executive Director and Co-founder of the Institute for Music and Neurologic Function, and has studied music and its effect on neurologic function for close to forty years.

What does research tell us about music and its effect on neurological disorders? Clinically, we’ve observed for many years that auditory rhythm actually drives motor function. This has been evidenced in people with Parkinson’s, and people with hemiparesis as a result of TBI and stroke. How and why music interventions have been effective has only recently been understood through neuroscience research and investigations.

What we know now is that when sound enters the auditory system, it actually stimulates primary areas of motor function, such as the cerebellum, the motor cortex, and the basal ganglia. Areas like the basal ganglia are affected in people with Parkinson’s. So we know that this auditory pulse, this actual stimulation of neurons in the basal ganglia, gets turned on when someone listens to a musical rhythm.

We know from clinical observation and also from scientific research that a rhythmic cue can actually influence both the initiation of gait as well as the periodicity of gait, and the ease at which somebody with Parkinson’s can move.

However, because Parkinson’s does affect the basal ganglia and other parts of motor timing, it also affects auditory perception of rhythm. There’s been some research showing that people with Parkinson’s may actually not feel the beat where we think the beat should be. And so, it’s important to have a way of assessing which beat works the best for them, using that beat consistently so that they can move with the same consistency.

Is rhythm the only aspect of music that has an effect on movement in Parkinson’s? Sometimes it’s not just the beat itself. It may be a certain sound or nuance of the sound that actually stimulates the movement better for one person with Parkinson’s than another.

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So, when you are using a music intervention in helping to treat someone with Parkinson’s, it’s important to look at the timbre, like the instrument that’s making the sound, as well as the rhythmic cueing. That assessment process is really crucial to optimizing the type of recovery, in the sense of ease of gait, that we can get with someone with Parkinson’s.

The specific areas of the brain that get stimulated by auditory rhythm are really spread out throughout the brain. It’s the cerebellum, the basal ganglia, the motor cortex, the frontal cortex—all of these areas are tied into the perception of rhythm.

The challenge is that when people have Parkinson’s, some of those areas of perception may break down. The person may not feel the beat at the same time that a person without Parkinson’s would feel it.

The question for a therapist is, where is this person feeling the pulse when they listen to music with a rhythmic cue? Once we understand that, we can actually optimize what the cue is going to be, whether it’s an anticipatory beat, whether it’s a different style of rhythm, to really optimize how well they’re going to be able to not only initiate movement, but then to consistently walk over time.

**Can you describe a typical gait training session using music?**

In order to optimize therapy for a specific patient, we have the patient tap to the rhythm in the tempo of their targeted gait cadence to determine where they perceive the beat, and if they can integrate the beat into their gait pattern. If they do that successfully, we’ll start with that beat when they get onto the treadmill.

Then we’ll see if they can consistently entrain their gait to that beat.

If we want to optimize them at a slightly faster tempo, then we can speed up that tempo in real time as the person is walking using our gait training treadmill. Then, we study them and observe their gait for the next few minutes. There’s an envelope of sound in addition to the rhythmic cue that can also enhance stride length as well as posture. Our gait trainer has music composed specifically for this type of treatment built right into the system, so we can engage these music elements in real time.

**Couldn’t you just use a patient’s favorite music in therapy?**

It’s important to distinguish the benefit of a piece of equipment that has integrated sound technology as different from a person using a treadmill with their own iPod or personal music list. Any personalized music—popular music or whatever they’re listening to—is going to change every two or three minutes.

Each time a song changes, that’s going to change how they walk and how they move. It’s not going to provide a consistent cue. It’s not going to help us regulate and monitor how that cue is effecting their walking.

Having a piece of equipment that provides musical cues designed specifically for treatment of movement disorders gives us the ability to not only provide the necessary cue but also to monitor its effectiveness for that patient, then to modify it to optimize their clinical outcomes.

**Can you share something interesting about using music for neurologic rehabilitation?**

What’s really fascinating and interesting to observe is when a patient with a movement disorder like Parkinson’s who has an unsteady gait before they approach the treadmill, can instantaneously adapt and change their gait in response to the rhythmic cue.

I think they’re surprised themselves at how easy it is for them to entrain to the rhythm and how consistent their movement becomes while they’re using the treadmill. In fact, there’s some carryover immediately when they step down. This synchrony of movement carries over to their gait afterwards.

**Conclusion**

Music’s ability to unlock movement has yet to be fully understood, but the difference it can make for patients has been proven through decades of research and clinical observation. Emerging technology, such as the music-enhanced treadmill Dr. Tomaino describes, shows promise that patients with Parkinson’s and other movement disorders can expect to see music-driven interventions being used at more clinics in the near future.

**Clinical Account**

**Music-Enhanced Gait Training**

Recently, I had the opportunity to see how music infused with traditional interventions changed a patient’s gait patterns in just 1-2 treatments sessions. The temporal gait parameters improvements were captured in the Gait Trainer 3 software objectively, supporting my own subjective observations.

In the midst of shortened treatment sessions and decreased length of stays, therapists face daily pressures to show patient progress that is objective, measurable, and evidence-based. In conjunction with scientific research strongly supporting music’s impact on movement in a relatively short amount of time, it only makes sense to me to incorporate music into everyday practice.

**Marketing Support**

Biodex supports music-enhanced Gait Trainer 3 users with marketing materials to help grow physician and patient awareness about this revolutionary technology.

David Wilcox, OTR/L, Clinical Applications Manager Biodex Medical Systems, Inc.
Harness Neuroplasticity for Patient Recovery

Individuals recovering after a stroke or other neurological event can benefit from activating neuroplasticity – the brain’s ability to change or “rewire.” A body weight support system can be a useful tool for implementing neuroplasticity principles for faster outcomes.

Here’s why:

• The earlier the intervention, the better for the patient. A harness system helps patients start exercising earlier in their recovery.

• Changing the brain requires repetition. With their weight supported, patients may exercise longer knowing they are safe from a fall.

• When a person feels safe from falling, they’ll be more willing to break out of their comfort zone and correctly repeat exercises.

• Therapists can also feel safe motivating patients to improve function using body weight support.

Learn more about equipment to help promote neuroplasticity: www.biodex.com/sphm

Parkinson’s-Focused Fitness Center Breaks Down Barriers to Exercise with Biodex Technology

Parkinson’s exercise programs offered at Eric Johnson’s Movement Revolution in the Chicagoland area combine peer motivation with Biodex devices such as the FreeStep SAS to drive progress beyond physical therapy.

“Our mission is to empower people with neurological conditions to live stronger every day, in all phases of life,” explains Eric Johnson, owner of Movement Revolution neuro intensive training centers in the Chicago area. With a focus on intense exercise for people with disabilities and neurological conditions, his locations in downtown Chicago, Deerfield, and western suburbs of Chicago (coming soon) allow clients to benefit from individualized training, a sense of community, and advanced exercise technology from Biodex Medical Systems, Inc.

Johnson’s decision to pursue medical fitness was motivated by the limits on insurance-covered therapy, particularly for patients with neurological issues: “There are few resources for people after they’re done with physical therapy. That was my driving force,” says Johnson. “I really like being on the community side of things and giving access to people to be active after they are done with physical therapy.”

Removing the Fear of Falling

Having experience with Biodex equipment from his work at Shirley Ryan, Johnson understood the value advanced technology brings to the client experience. For the new Deerfield facility, it all began with eliminating obstacles with Biodex’s FreeStep SAS Supported Ambulation System.

The FreeStep features harnesses attached to a ceiling-mounted track that is customized to suit the facility. Once in the harness, clients can perform standing and over-ground exercise, work out on a treadmill, and move from one task to the other, without fear of falling.

For anyone with limited mobility, whether from a movement disorder to general muscle weakness, fear of falling is one of the biggest inhibiting factors for people to be more active, according to Johnson.

“The FreeStep system has been instrumental in helping us give people the ability to walk more freely and really push the boundaries of what they can do. That goes for people with Parkinson’s, stroke, and all neurological conditions. The FreeStep really allows us to say, you’re not going to fall.”

Building a Sense of Community

Movement Revolution offers a spectrum of programs and activities from more personal to large groups, as well as individualized training where they are able to target specific symptoms such as freezing. Their largest group class is Rock Steady Boxing, a non-contact boxing class for people with Parkinson’s disease where boxing is used as a tool to elicit bigger, more dynamic movements. The FreeStep SAS helps the boxers push themselves while feeling more confident on their feet.

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“We have to push one’s ability level and retrain the body to walk and balance with more confidence and build up strength. We would not be able to do this if it wasn’t for the access that the FreeStep gives us. It is a very unique tool that opens a lot of doors for more people to be more active.”

Practice, Repetition, Intensity = Neuroplasticity

If you want neuroplasticity you must have intensity.

If you want intensity you must have the patient’s interest.

If you want their interest it’s extremely important to show patient progress that they can see and feel.
**Clinical Perspective**

**Pedaling to Recovery After 15 Strokes**

Stroke is the leading cause of serious, long-term disability in the United States – and the condition for which many of the Biodex rehabilitation devices are focused. More than 40% of stroke victims are hemiparetic with upper and lower extremity weakness. Biodex devices address both upper and lower extremity exercise through the use of biofeedback, reinforcing corrective actions and documenting progress.

For patients suffering from stroke, the BioStep™ 2 Semi-Recumbent Elliptical combines components of an exercise bicycle and an elliptical trainer, allowing the patient to benefit from endurance training and aerobic exercise. The fluid, elliptical motion is forgiving on the knees, ankles, hips and lower back so even the most debilitated patients can benefit from low-impact functional movement.

After suffering multiple strokes, Melinda sought therapy at Emory Brain Health Center. She regained movement and quality of life with the help of the BioStep 2.

**Therapist Toni Olliff recalls:**
The objectives of her therapy are to improve her endurance, balance, and walking skills. Ordinarily, we use the BioStep to work both arms and legs in a symmetrical fashion, to build both leg and arm endurance. But in some sessions, we work just legs. To simulate hills, I increase the resistance against which she must pedal. When she started therapy in February, a BioStep resistance of level 1 challenged her. Two months later, she’s up to a level 4. She started out being able to pedal only five minutes, but in two months, she increased to twenty minutes.

"When she started therapy in February, a BioStep resistance of level 1 challenged her. Two months later, she’s up to a level 4."
Music Moves Me

Parkinson’s Program

Help patients with Parkinson’s disease improve ambulation, increase function and reduce the risk of fall. With more than 60,000 new Parkinson’s cases reported annually, Biodex Balance & Mobility devices can help this growing, and underserved population. Intense exercise has been shown to slow the progression of symptoms.

NEW Balance Challenge

Fall Risk & Mobility Program

Biodex offers a six-week Balance Challenge to help attract older adults to a Senior Wellness program. Designed to improve balance and mobility, the challenge takes members through a series of progressive exercises. Objective results show progress in numbers from beginning to end.

The numbers create an environment of friendly competition. Whether they challenge themselves to improve, or compare scores with others in the program, the Biodex Balance Challenge helps older adults achieve balance goals and maintain their independence.

FINANCE TO OWNERSHIP

Includes:

950-194 medBike® Whole Body Cycle
950-440 Balance System™ SD
950-400 Gait Trainer™ 3 Treadmill
950-413 Music-Assisted Therapy

Finance combination for 60 months.
Ask about term details.
Freight calculated separately.

FINANCE TO OWNERSHIP

Includes:

950-560 Sit2Stand™ Squat-Assist Trainer
950-440 Balance System™ SD
950-240 BioStep™ 2 Elliptical Ergometer

Finance combination for 60 months.
Ask about term details.
Freight calculated separately.
Safe freestanding balance training is within your grasp

- Improve safety
- Minimize fear of falling
- Enhance efficacy of balance training

Versatile and simple to use, the FreeSway™ Handles help maximize functional training for any patient with balance issues.

See inside for details.

Floating handles provide security without impeding balance recovery. Adjust handlebar height to accommodate patients 5' to 6' 4" tall.