

# Drumming as a Therapeutic Tool

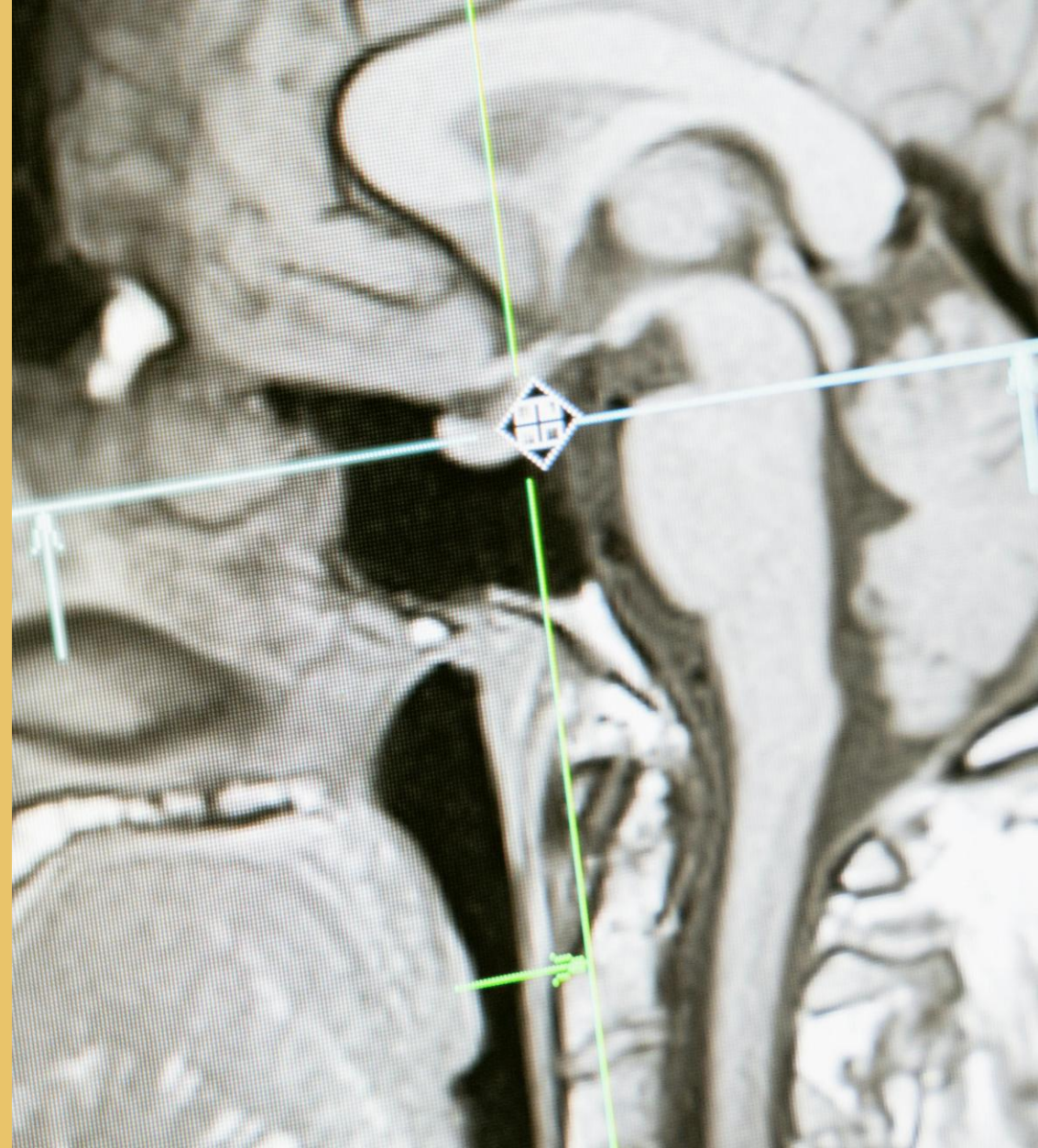


Barbara Luborsky, OTR/L  
MMPI  
June 21, 2025

# Structural Brain Changes

Increased Grey Matter Volume in  
Motor and Auditory Cortices

Neuroplasticity in the Cerebellum



# Functional Brain Changes

## Enhanced Connectivity

- ↑ functional connectivity-motor/auditory/visual
- ↑ synchronized activity across hemispheres

## Improved Sensorimotor Integration

Crucial for timing and rhythmic accuracy



# Cognitive and Psychological Benefits

## Enhanced Executive Function

- Improved attention, working memory, and cognitive flexibility.
- Potentially protective or developmental cognitive effects.

## Reduced Anxiety and Depression

- Reduces anxiety, depression, and PTSD symptoms, likely through rhythmic entrainment and social bonding.
- Linked to modulation of the hypothalamic-pituitary-adrenal (HPA) axis, which regulates stress response.

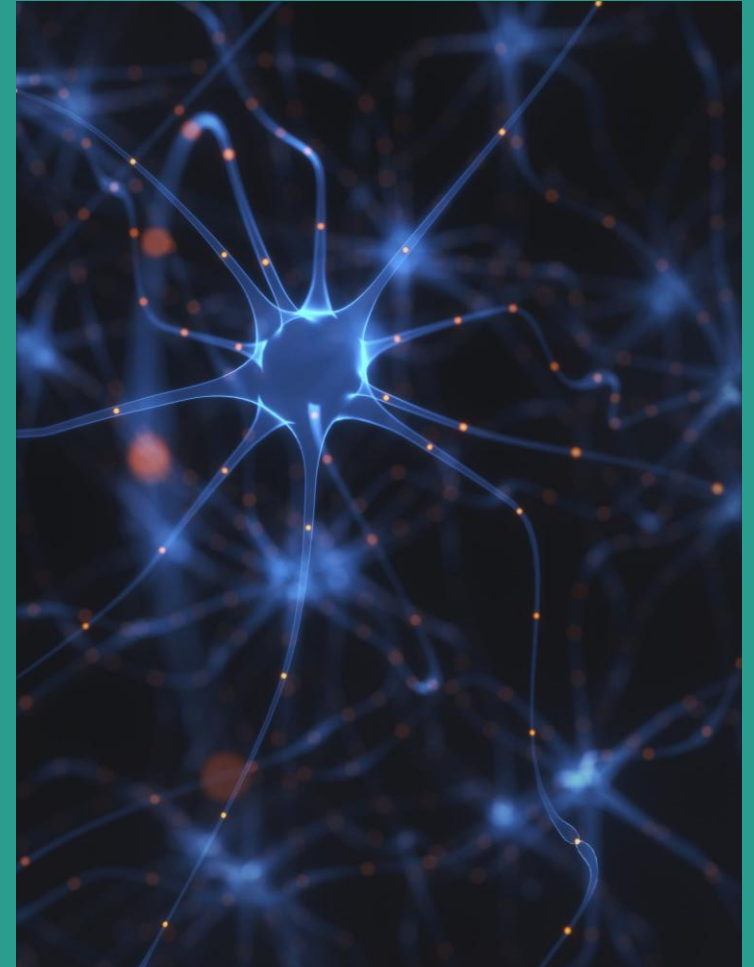
# Neurochemical Changes

## Dopamine and Endorphins

↑ levels of dopamine and endorphins, improving mood and motivation.  
Drumming-induced flow states

## Cortisol Reduction

↓ Cortisol (stress hormone) levels after drumming.





# Therapeutic and Rehabilitation Applications

**Parkinson's Disease:** Rhythmic auditory stimulation improves gait and motor control.

**Stroke Rehabilitation:** Bimanual drumming helps retrain motor pathways.

**ADHD and Autism:** Rhythm regulation improves attention, impulse control, and social behavior.

# Therapeutic Drumming with the Pediatric Population

- Autism
- ADHD
- DCD/ Dyspraxia
- Emotional/Behavioral Challenges
- Trauma & ACE
- Cognitive & Executive Functions



# Neurodevelopmental Disorders

## Autism Spectrum Disorder (ASD)

Improvements in social interaction, emotional regulation, attention, and non-verbal communication (e.g., turn-taking, eye contact) during rhythmic play.



Yoo, G. E., & Kim, S. J. (2018). Dyadic drum playing and social skills: Implications for rhythm-mediated intervention for children with autism spectrum disorder. *Journal of Music Therapy*, 55(3), 340–375.

*Found that Drumming-based rhythmic intervention improved joint attention and social reciprocity in children with ASD.*

# Attention Deficit Hyperactivity Disorder (ADHD)

Rhythmic drumming supports behavioral regulation, sustained attention, and impulse control.

Rhythmic entrainment is thought to help align internal timing networks (fronto-striatal circuits).



Puyjarinet, F., Bégel, V., Lopez, R., Dellacherie, D., & Dalla Bella, S. (2017). Children and adults with Attention-Deficit/ Hyperactivity Disorder cannot move to the beat. *Scientific Reports*, 7, 11550.

Showed drumming practice improved motor timing and attentional performance in children with ADHD.

# DCD/ Dyspraxia

↑ fine and gross motor coordination, bilateral hand use, and timing.

Structured rhythm-based motor training can ↑ planning and execution of motor tasks.

Snyder, C., Bruhn, K. T., & Bittman, B. B. (2004). Creative musical expression as a catalyst for quality-of-life improvement in inner-city adolescents placed in a court-referred residential treatment program. *Advances in Social Work, 5*(2), 8–19.



# Emotional and Behavioral Disorders



- Reductions in aggression, anxiety, and oppositional behavior.
- An emotional outlet and a means for nonverbal self-expression.

Bittman, B. B., Dickson, L., & Coddington, K. (2009). Creative musical expression as a catalyst for quality-of-life improvement in inner-city adolescents placed in a court-referred residential treatment program. *Advances in Social Work, 24*, 8–19. Studies of at-risk youth, showing that group drumming reduced hostility and improved self-regulation.

Smith C, Viljoen JT, McGeachie L. African drumming: a holistic approach to reducing stress and improving health? *J Cardiovasc Med (Hagerstown)*. 2014 Jun;15(6):441-6. doi: 10.2459/JCM.0000000000000046. PMID: 24983262.



# Trauma and Adverse Childhood Experiences (ACEs)



Rhythmic drumming may help re-regulate the nervous system (via polyvagal theory).

Thought to engage subcortical regulation, improving emotional safety and grounding.

Often used in trauma-informed schools or therapy programs.





# Educational and Cognitive Benefits

Associated with improvements in:

- Working memory
- Sequencing skills
- Math fluency (via improved temporal processing)

Studies show a positive effect on classroom behavior and academic performance.

## Summary Table: Pediatric Drumming Applications

<b>Condition</b>	<b>Documented Benefits</b>	<b>Mechanism</b>
Autism (ASD)	Social skills, attention, emotional regulation	Auditory-motor synchronization, social entrainment
ADHD	Improved attention, impulse control	Timing networks, executive function
DCD / Dyspraxia	Motor planning, coordination	Bimanual coordination, cerebellar activation
Behavioral Disorders	Reduced aggression, improved self-regulation	Emotional expression, rhythmic self-soothing
Trauma / ACEs	Emotional regulation, reduced stress	Somatosensory integration, vagal tone regulation

(Created with AI)

# Key Points

## Theta Wave Enhancement (Trance and Meditation)

Repetitive drumming at 4–8 beats per second

Associated with relaxation, dream-like states, and creative imagery. (Maxfield 1990)

## Alpha Wave Increases

Participatory group drumming -relaxation and social bonding. (Gingras et al. (2014)

Alpha and theta enhancement during and after drumming improvisation in athletes, supporting mental recovery. (Henz & Schöllhorn 2017)

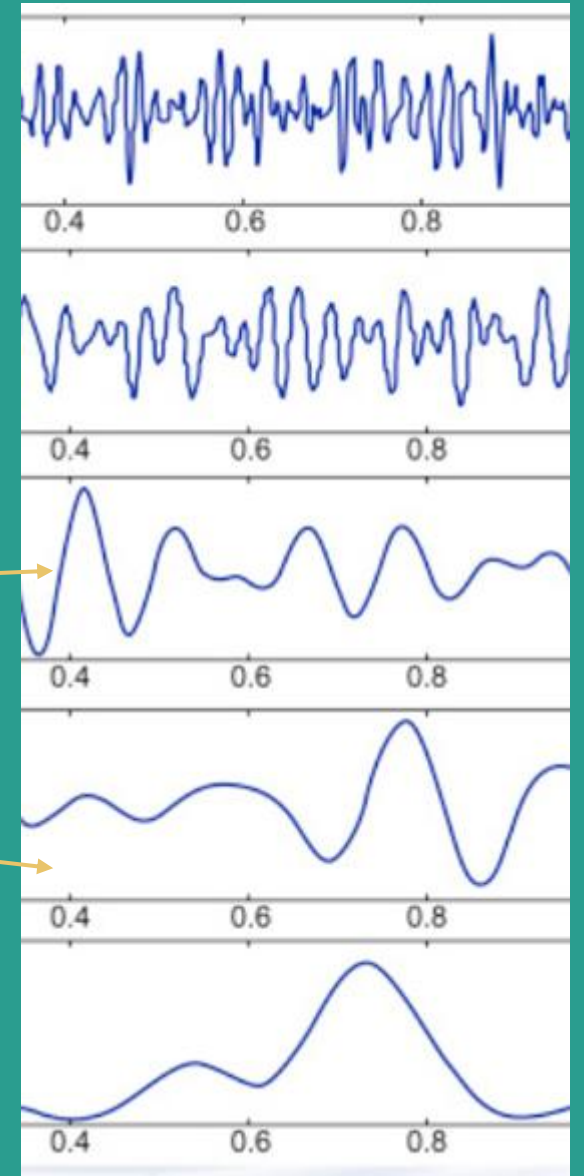
## Beta and Gamma in Skilled Drummers

Advanced drummers exhibit increased beta and gamma activity during improvisation and complex pattern execution, reflecting sensorimotor integration and high-level timing coordination.

# How Drumming Alters Brainwave Patterns

The brain has a natural tendency to synchronize its oscillations to rhythmic sensory input, especially in alpha (8–12 Hz) and theta (4–8 Hz) frequency ranges.

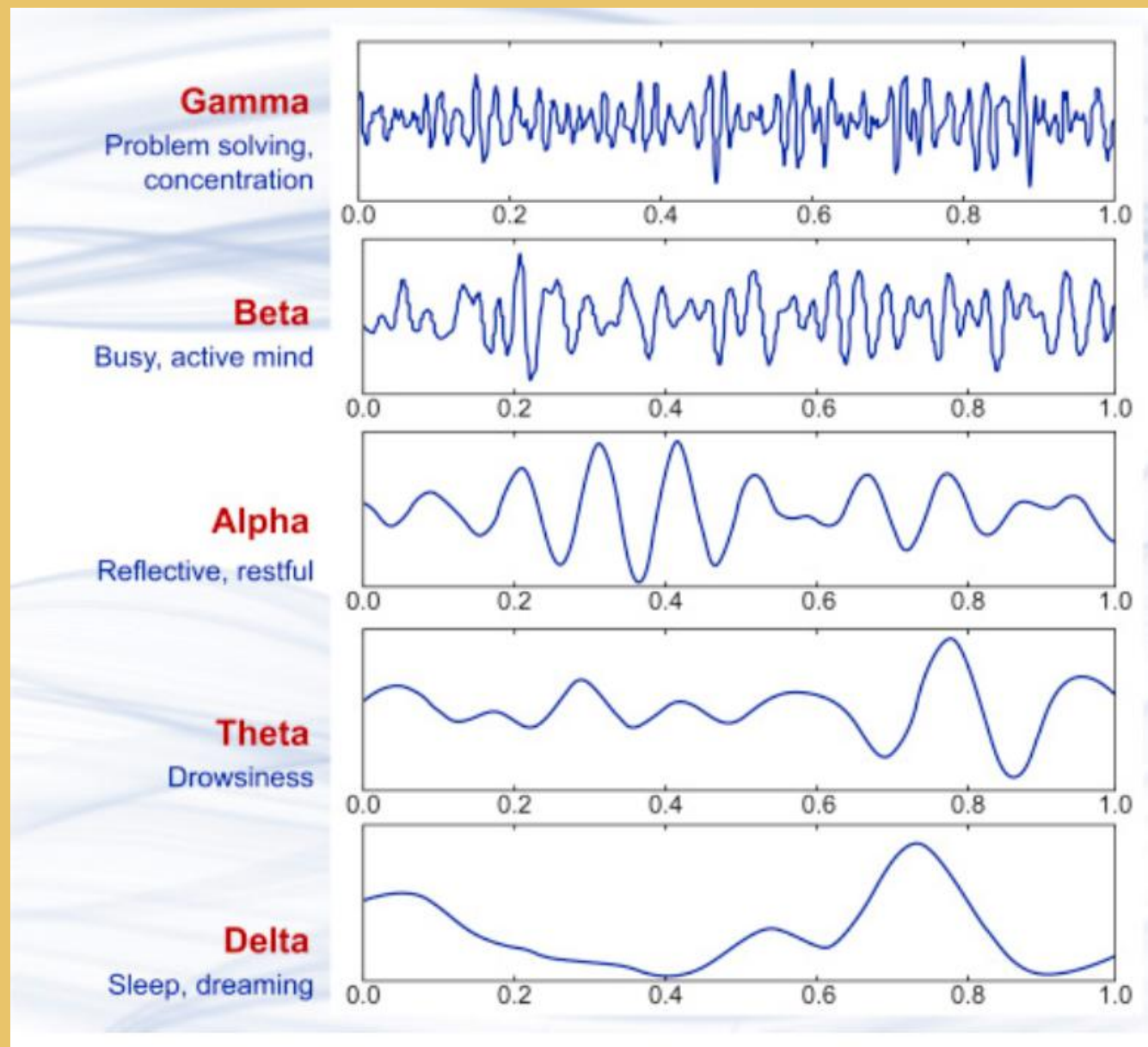
This is known as auditory or rhythmic entrainment.




<b>Frequency band</b>	<b>Frequency</b>	<b>Brain states</b>
Gamma ( $\gamma$ )	35-100Hz	Concentration
Beta ( $\beta$ )	12-35Hz	Anxiety dominant, active, external attention, relaxed
Alpha ( $\alpha$ )	8-12Hz	Very relaxed, passive attention
Theta ( $\theta$ )	4-8Hz	Deeply relaxed, inward focused
Delta ( $\delta$ )	0.5-4Hz	Sleep

Priyanka A. Abhang, Bharti W. Gawali, Suresh C. Mehrotra, Chapter 2 - Technological Basics of EEG Recording and Operation of Apparatus, Editor(s): Priyanka A. Abhang, Bharti W. Gawali, Suresh C. Mehrotra, Introduction to EEG- and Speech-Based Emotion Recognition, Academic Press, 2016, Pages 19-50, ISBN 9780128044902, <https://doi.org/10.1016/B978-0-12-804490-2.00002-6>.

# Brainwave Images





Jeff Strong  
Rhythmic Entrainment  
Intervention  
(REI)

<https://www.stronginstitute.com/>



Human Consciousness can be directly affected by an auditory stimulus = *Auditory Driving*

Traditional 4-beat per second pulsation yields bilateral neurological synchronization.

8-beat per second pulsation induces alpha brain waves (a relaxed neurological state where sensory processing is optimized).

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Complex Rhythms and RAS  
Activation

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Specific Techniques Produce  
Universal Synchronization

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Each Rhythm Elicits A Definite  
Observable Response Over Time



Daily Listening for  
Long-term Change

Universal Calming  
Effects

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*Free digital download from REI!*

<https://www.stronginstitute.com/calm-for-anxiety/>

<https://brainstimaudio.com/>

Online regulation service through Strong Institute



## Featured Blog Posts

### Drumming Stimulates Gamma Brainwave Activity

In this video, I show how complex, unpredictable drumming rhythms stimulate gamma brainwave activity. I also show that specific rhythms and tones activate the brain. ...

[Read More](#)

### EEG Brainwave Activity While Listening to REI Drumming Compared to Brain Shift Radio's Ambient Mix

In this video, I show you EEG brainwave activity of an adult male with ADD as he listens to REI drumming rhythms and Brain Shift ...

[Read More](#)

### Watch EEG Brainwave Activity of an Adult with ADD Listening to REI Drumming

In this video, I share real-time EEG brainwave activity of an REI client: an adult male with ADD. I show you how his brain entrains ...

[Read More](#)

## REI for Calm: 3 clinical studies show reductions in anxiety and anxiety-based behaviors

Since our first clinical study in 1994, we have focused on how to reduce anxiety and induce calm. For ten years our research examined children ...

[Read More](#)

## Quantitative Data Shows that Listening to Complex Drumming can Increase Attention.

Several years ago we created a Continuous Performance Test (CPT) to see if listening to complex drumming rhythms can improve focused attention. We created this ...

[Read More](#)

## Jeff Strong: How I Use REI Drumming for Sensory Processing

In this video Jeff shows how he approaches the three types of sensory processing issues – hyper-sensitivity, hypo-sensitivity, and sensory discrimination. He plays examples of ...

[Read More](#)

## Featured Articles

Rhythmic Entrainment Intervention (REI) Drumming Rhythms Reduce Anxiety and Improve Language, Eye Contact and Socialization in a Child with Autism

Rhythmic Entrainment Intervention as it Applies to Children with Autism

World Percussion and Rhythm Magazine Interview with Jeff Strong

A Look at Rhythmic Entrainment Intervention by Its Creator

Calming Anxiety-Based Behaviors in Autism with Rhythmic Entrainment Intervention (REI) Drumming Rhythms

Rhythmic Entrainment Intervention: A Theoretical Perspective

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Quantitative Data Shows that Listening to Complex Drumming Can Increase Attention

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REI Rhythms Beat Ritalin for Adult with Attention Deficit Disorder

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A Study for Improved Concentration by Acoustic Drum Rhythms Music  
Medicine Therapy

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Blending Ancient Techniques with Modern Research Findings

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Rhythmic Entrainment Intervention For Adults With Autism

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REI for Calm: 3 Clinical Studies Show Reductions in Anxiety and Anxiety-  
based Behaviors

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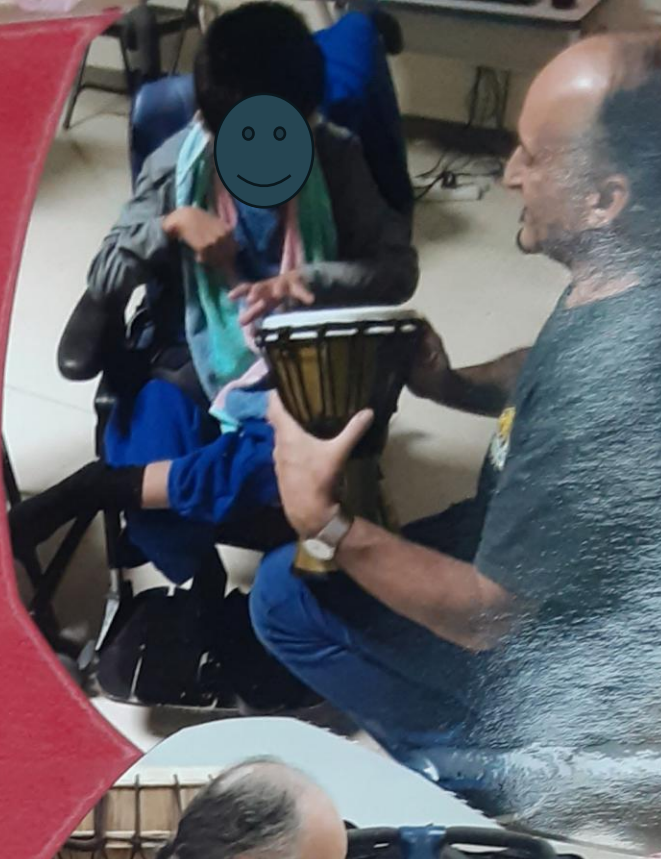
# Michael Marschark, OTR

- OT for children with high needs for more than 20 years
- Uses drumming in his treatment sessions
- Has a Drum Club at the school where he works
- Retired just a few years ago



Sweet Music  
in OT with  
Mr. Mike







Barbara Luborsky



# Questions & answers



# Resources

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