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CLINICAL & TRANSLATIONAL SCIENCE INSTITUTE
AT THE UNIVERSITY OF KANSAS

Music-elicited analgesia in fibromyalgia

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KUMC Dept. of Neurology

Disclosures

Funding: Frontiers Arts+Medicine Trailblazer Award

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Who Am I?

Cognitive Neuroscientist (PhD)

Imaging Researcher (MRI, PET, CT, SPECT-CT, brain, kidneys, lungs)

Music Psychologist (MA)

Musician (MA piano, UG flute, composer, singer)

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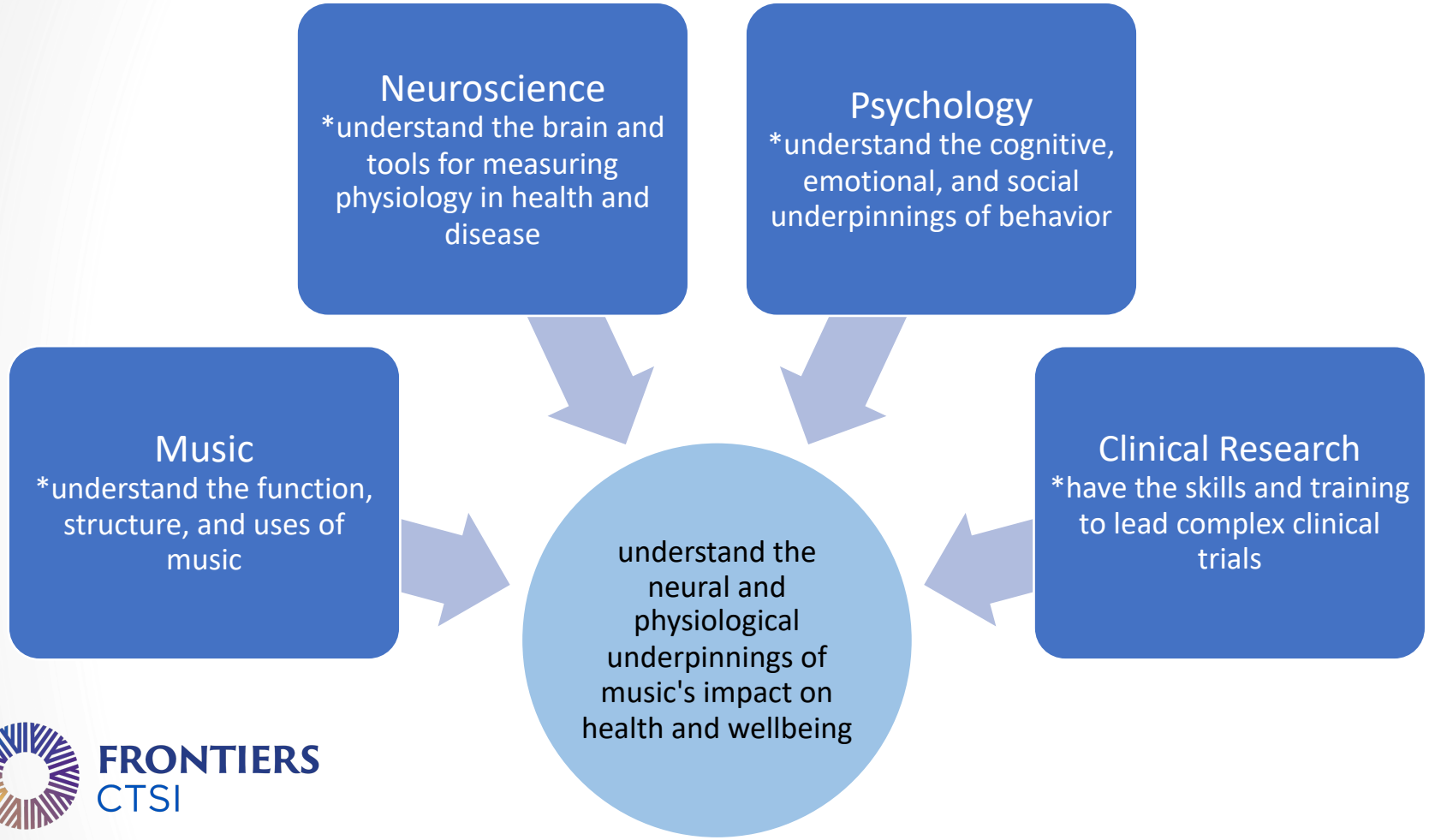
Who Am I?



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Who Am I Not?

Clinician

Music Therapist


frontiers in Human Neuroscience

PERSPECTIVE
published: 01 May 2015
doi: 10.3389/fnhum.2015.00223

The challenges and benefits of a genuine partnership between Music Therapy and Neuroscience: a dialog between scientist and therapist

Wendy L. Magee[1] and Lauren Stewart[2]*

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Music and Health

Physiology

- Making Music
  - Respiratory Function
  - Motor Function
  - Multisensory integration
  - Coordination
- Hearing/Experiencing Music
  - Dopamine
  - Autonomic Nervous System
  - Entrainment/Scaffolding

Psychology

- Emotion
- Meaning and Memory
- Cueing/Focus/Distraction

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Music in the Brain

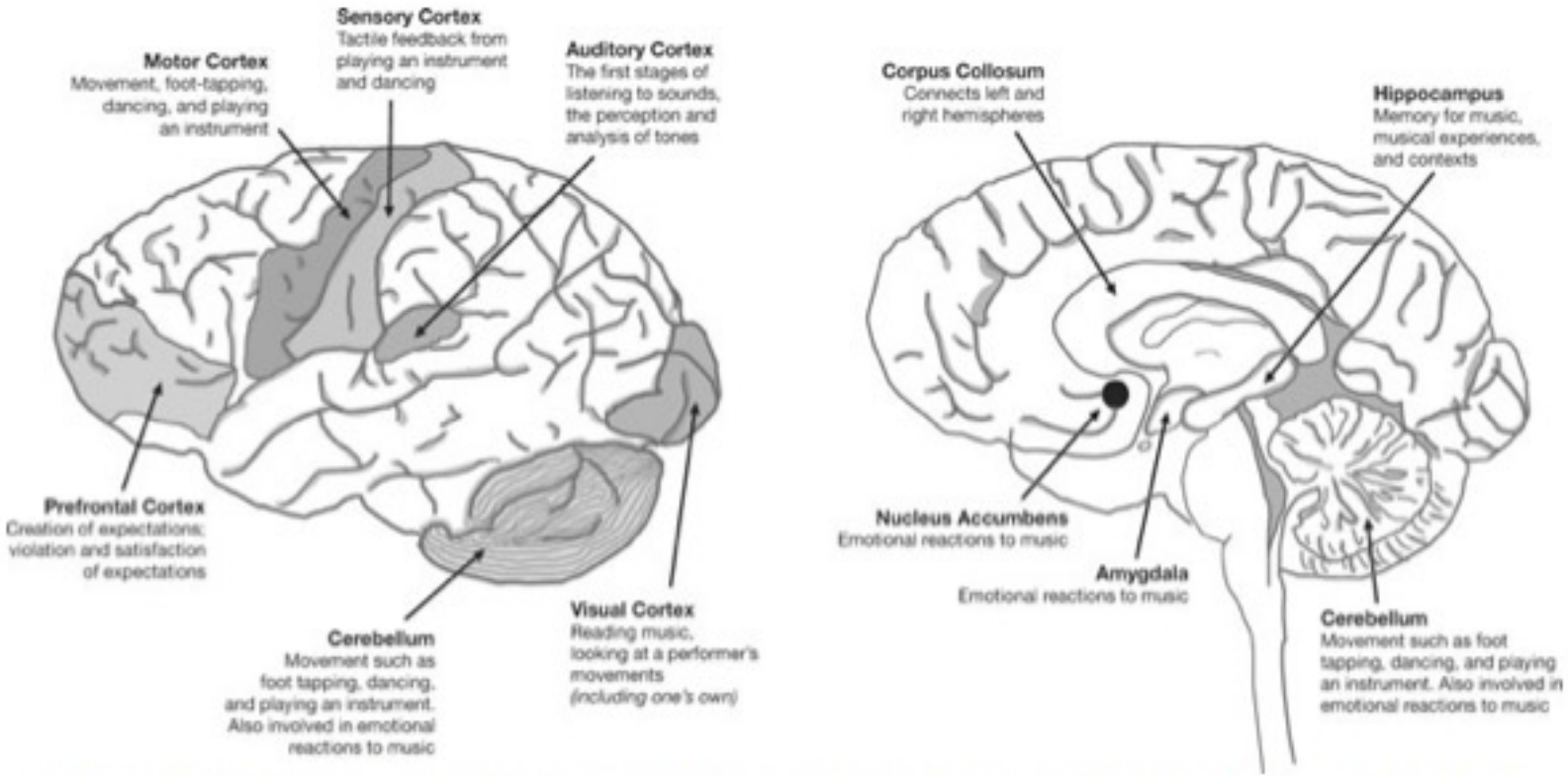

Figure 1. Core brain regions associated with musical activity. Based on Tramo 2001 and updated in 2006 (from Levitin 2006).

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Levitin and Tirovolas (2009)

Fibromyalgia

Chronic

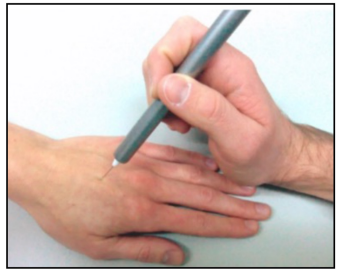
Widespread

Hypersensitivity

Quantitative Sensory Testing

A.

B.



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Analgesic Response to Music

Surgery

Post-op recovery

Orthodontics

Orthopedic rehab

CHRONIC PAIN and FM

- Music listening improves mobility, modifies brain activity
- Preventative tool?

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Why This Study

Physiological mechanism – ANS

Objective, quantitative measures of pain – QST

Is music special?

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frontiers | Frontiers in Pain Research

TYPE Original Research
PUBLISHED 15 September 2022
DOI 10.3389/fpain.2022.953118

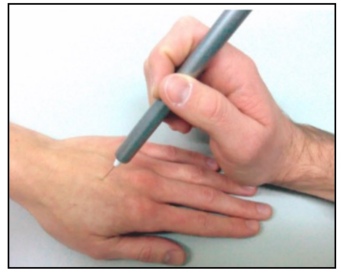
Autonomic nervous system markers of music-elicited analgesia in people with fibromyalgia: A double-blind randomized pilot study

Rebecca J. Lepping[1]*, Miranda L. McMillan[2], Andrea L. Chadwick[2], Zaid M. Mansour[3], Laura E. Martin[1,4,5] and Kathleen M. Gustafson[1,6]

Methods

A.

B.



N=9 adults with fibromyalgia (FM)

Music Listening to reduce pain sensitivity

Pain tolerance and threshold

- measured objectively
- quantitative sensory tests

Autonomic nervous system (ANS) reactivity

- measured with electrocardiogram (ECG)

Randomized: instrumental Western Classical music/ nature sound control

Two days of testing: Audio condition/ Silence

Analgesic Effects

- Music listening > simple auditory distraction

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Methods – Bias reduction

Noise-canceling headphones
- Minimize distractions
- Blind the researcher

Four audio tracks identified by number only
- Music, Nature Sounds, Silence (2)
- Blind the researcher

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Methods – Music features

Professional recordings of instrumental Western classical music

All participants heard the same pieces in the same order

Instrumentation: piano solo to full orchestra

- No lyrics or heavy percussion

Pitch ranged across pieces

Tempo for all pieces was slow (~60 beats per minute)

Major keys or minor keys

Primarily consonant harmonies and sustained melodic phrases

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Methods – Active control

Professional recordings of nature sounds
- Forest, river, and wind sounds and birdsong
- Selected by the researcher
- No added music

All participants heard the same recording

Control of non-musical analgesic effects such as distraction

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Results

	Music group ($n = 4$) [M (SD)]	Nature group ($n = 5$) [M (SD)]	Z (p)
Temporal summation: audio	20.25 (14.29)	4.13 (5.60)	–
Temporal summation: silence	20.17 (13.14)	9.40 (7.44)	–
Session difference: audio vs. silence	–	–	39.00 (0.051†)
Group difference: silence	–	–	2.00 (0.06†)
Group difference: audio	–	–	2.00 (0.06†)
Group difference in between session change	–	–	19.00 (0.03*)
Mechanical pain tolerance: audio	4.12 (1.02)	5.17 (0.85)	–
Mechanical pain tolerance: silence	4.18 (1.00)	5.05 (0.94)	–
Session difference: audio vs. silence	–	–	18.00 (0.59)
Group difference: silence	–	–	14.00 (0.41)
Group difference: audio	–	–	16.00 (0.19)
Group difference in between session change	–	–	14.00 (0.41)

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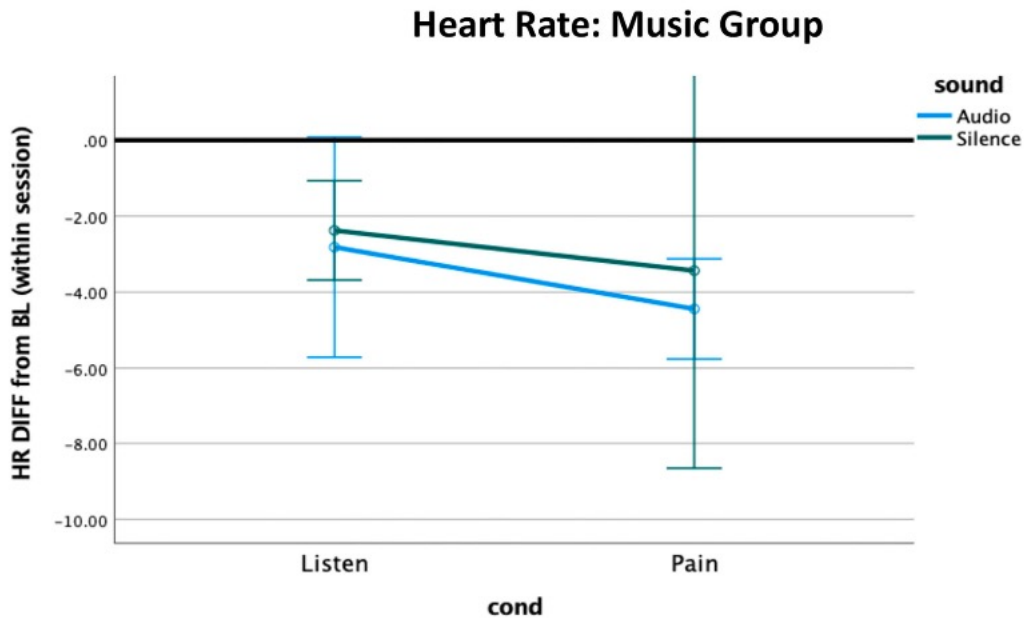
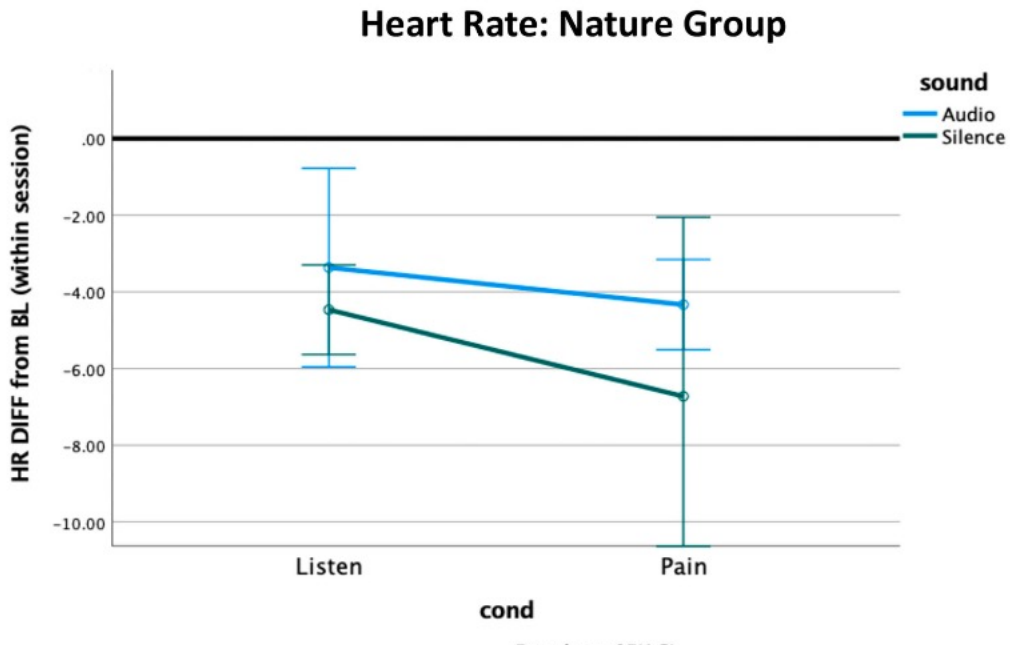
Results

A



B



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Conclusions

Strong effect of cognitive distraction

- Reduced temporal summation during both audio conditions
- *The auditory stimulus was effective in reducing pain*

Nature group showing an analgesic effect

Music group showed none

- Opposite to our hypothesis (Nature > Music)
- May be related to anxiety (higher in Nature group)
  - or pain (higher in Music group)
- Very small study (N=9)

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Next Steps

Larger trial – R01

Correlations with subjective measures of anxiety, pain catastrophizing, resilience, and measures of music experience and enjoyment

Brain – Functional MRI

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Thanks to the Ensemble!

- Miranda McMillan
  - CRA for study
- Andrea Chadwick
  - Collaborator – KUMC Anesthesiology
  - Expertise in pain and fibromyalgia
- Zaid Mansour
  - Collaborator – Hashemite University, Jordan
  - Expertise in physical therapy and music
- Laura Martin
  - Collaborator – KUMC Population Health/HBIC
  - Expertise in cognitive neuroscience and reward
- Kathleen Gustafson
  - Collaborator – KUMC Neurology/HBIC
  - Expertise in autonomic nervous system and music
- Study Participants
- Funding and Support
  - Frontiers Arts+Medicine Trailblazer (NIH UL1TR002366)
  - NIH K23GM123320 (Chadwick)
  - Hoglund Biomedical Imaging Center (HBIC)
    - William Brooks
    - Justine Kigenyi
    - HBIC Human Imaging Core
    - Forrest and Sally Hoglund

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Thank you for your time

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