Research on Music, Mind, Body and Brain

Petri Toiviainen
Department of Music, Art and Culture Studies
University of Jyväskylä

MUSIIKIN, MIELEN, KEHON JA AIVOJEN TUTKIMUKSEN HUIPPUYKSIKKÖ
CENTRE OF EXCELLENCE IN MUSIC, MIND, BODY AND BRAIN

Teknodida 5.2.2023

UNIVERSITY OF JYVÄSKYLÄ

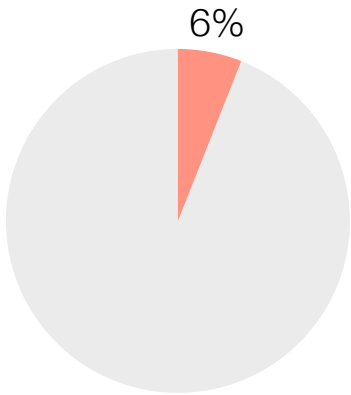
UNIVERSITY OF HELSINKI

Centre of Excellence?

- Academy of Finland Centre of Excellence program 1995–
  - funding call every 4 years, funding period 8 years

> The units granted CoE status by the Academy of Finland are scientifically first-rate research communities that have capacity for renewal and high societal impact. The CoE Programmes contribute to the renewal of science by supplying new research topics, new methods and approaches, and new research teams. Thanks to the long-term funding provided in collaboration with CoE host organisations, the funding instrument effectively works as an incentive for risk-taking and new initiatives in research.

- Centre of Excellence program 2022–2029
  - 184 applications, 11 selected



Principal Investigators

Petri Toiviainen
music cognition
music information science

director
subproject leader

Jaakko Erkkilä
music therapy
psychotherapy

Suvi Saarikallio
music and emotions
music and wellbeing

MUSICONNECT

UNIVERSITY OF JYVÄSKYLÄ

Teppo Särkämö
neuropsychology
music rehabilitation

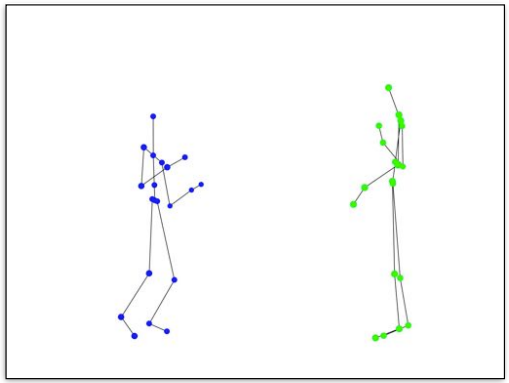
vice-director
subproject leader

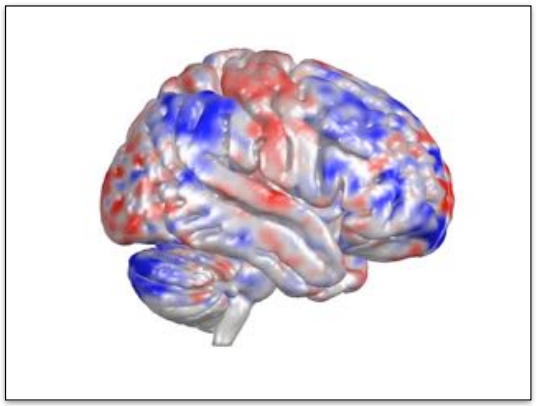
Minna Huotilainen
music and education
music and neuroplasticity

subproject leader

Teija Kujala
cognitive neuroscience
language, music and brain

UNIVERSITY OF HELSINKI





transfer effects

Music for the ageing brain: Cognitive, emotional, social, and neural benefits of musical leisure activities in stroke and dementia

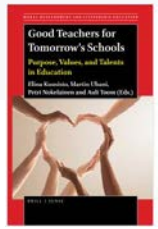
Dementia
2018, Vol. 17(6) 670–685

DOI: 10.1177/1471301217729237
journals.sagepub.com/home/dem
SAGE

Teppo Särkämö
University of Helsinki, Finland

Experimental Evidence on Connections between Speech and Music: Possible Applications on Learning

Minna Huotilainen, Teija Kujala




mood


learning

frontiers in Psychology

Music Therapy for Depression Enhanced With Listening Homework and Slow Paced Breathing: A Randomised Controlled Trial

*Jaakko Erkkilä[1], Olivier Brabant[1], Martin Hartmann[1], Anastasios Mavrolampados[1], Esa Ala-Ruona[1], Nerdinga Snape[1], Suvi Saarikallio[1] and Christian Gold[2,3]**

NORDIC JOURNAL OF MUSIC THERAPY
2021, VOL. 30, NO. 4, 357-376
https://doi.org/10.1080/08098131.2020.1837210
Routledge Taylor & Francis Group

Effects of maternal singing during kangaroo care on maternal anxiety, wellbeing, and mother-infant relationship after preterm birth: a mixed methods study

Kaisamari Kostilainen[a], Kaija Mikkola[b], Jaakko Erkkilä [c], and Minna Huotilainen[a,d]


wellbeing

MUSIC EDUCATION RESEARCH
2021, VOL. 23, NO. 5, 634-646
https://doi.org/10.1080/14613808.2021.1965564
Routledge Taylor & Francis Group

The significance of music in early childhood education and care of toddlers in Finland: an extensive observational study

Inkeri Ruokonen [a], Mari Tervaniemi [b,c], and Jyrki Reunamo [d]


health

Strategies and mechanisms in musical affect self-regulation: A new model

MUSICÆ SCIENTIÆ

Margarida Baltazar
University of Jyväskylä, Finland

Suvi Saarikallio
University of Jyväskylä, Finland


motor function

MUSIIKIN, MIELEN, KEHON JA AIVOJEN TUTKIMUKSEN HUIPPUYKSIKKÖ
CENTRE OF EXCELLENCE IN MUSIC, MIND, BODY AND BRAIN

World Health Organization
REGIONAL OFFICE FOR Europe

(2019)

HEALTH EVIDENCE NETWORK SYNTHESIS REPORT 67

What is the evidence on the role of the arts in improving health and well-being?

A scoping review

Global Council on Brain Health
A COLLABORATIVE FROM AARP

(2020)

Music on Our Minds:
The Rich Potential of Music to Promote Brain Health and Mental Well-Being

Neuron

NeuroView

NIH/Kennedy Center Workshop on Music and the Brain: Finding Harmony

(2018)

Current gaps in research on music

gaps

Lack of unifying framework

music cognition studies
- are small-scale
- have narrow focus
- use inconsistent methods

Insufficient ecological validity

limited focus on
- natural environments
- multimodal behaviour
- social interaction

Inadequate knowledge on musical interventions

studies on musical interventions
- lack proper control conditions, follow-up
- overlook social interactive power
- overlook individual variation

our solutions

- large-scale research
- common multimodal assessment methods

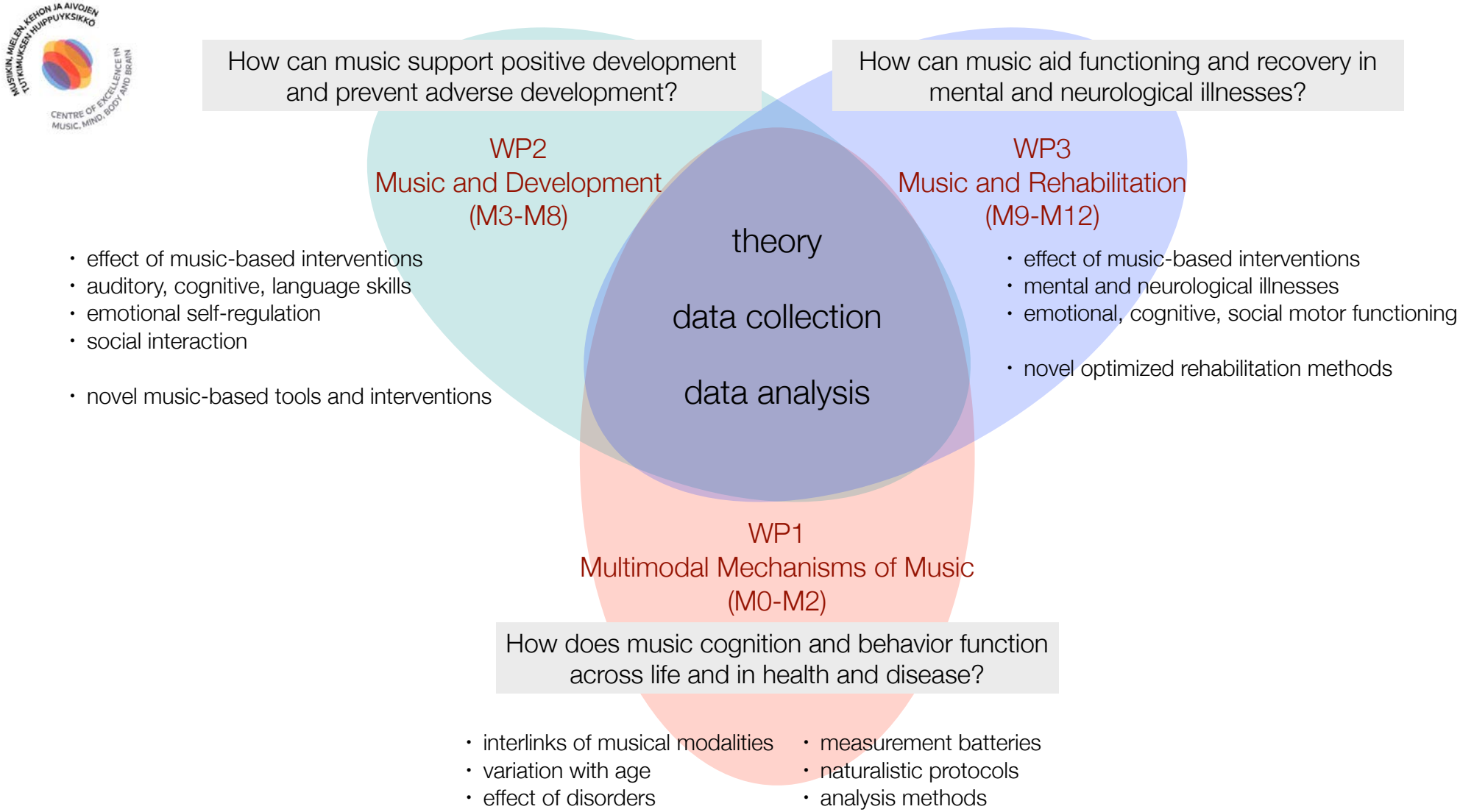
- data collection with naturalistic musical tasks, real-life music interventions
- method development for naturalistic data analysis

- large-scale RCTs
- discovery of individual variation and mechanisms behind effects
- optimization of existing methods

World Health Organization Europe (2019)
HEALTH EVIDENCE NETWORK SYNTHESIS REPORT 67
What is the evidence on the role of the arts in improving health and well-being?
A scoping review

Global Council on Brain Health (2020)
Music on Our Minds:
The Rich Potential of Music to Promote Brain Health and Mental Well-Being

Neuron
NeuroView (2018)
NIH/Kennedy Center Workshop on Music and the Brain: Finding Harmony


How can music support positive development and prevent adverse development?
How can music aid functioning and recovery in mental and neurological illnesses?
WP2
Music and Development
(M3-M8)
WP3
Music and Rehabilitation
(M9-M12)
theory
data collection
data analysis
• effect of music-based interventions
• auditory, cognitive, language skills
• emotional self-regulation
• social interaction
• novel music-based tools and interventions
• effect of music-based interventions
• mental and neurological illnesses
• emotional, cognitive, social motor functioning
• novel optimized rehabilitation methods
WP1
Multimodal Mechanisms of Music
(M0-M2)
How does music cognition and behavior function across life and in health and disease?
• interlinks of musical modalities
• variation with age
• effect of disorders
• measurement batteries
• naturalistic protocols
• analysis methods

WP1 Multimodal Mechanisms of Music	M0 Neurocognition of music across the lifespan in health and disease
	M1 Rhythmic, social, and collective entrainment in music-induced movement
	M2 Defining, operationalizing, and measuring emotional competence through music
WP2 Music and Development	M3 Corporeal and affective entrainment in people with and without autism
	M4 Music in everyday health and self-regulation
	M5 Impact of musical interventions on language learning at school
	M6 Empowering educators with musical methods for teaching
	M7 Origins of language development deficits and the influence of music
	M8 Language development deficits and early interactive music intervention
WP3 Music and Rehabilitation	M9 Optimizing the use of music in residential and home dementia care
	M10 Efficacy of mobile music technology in stroke rehabilitation
	M11 Multimodal interaction in music therapy for social communication challenges
	M12 Effectiveness of music therapy for the treatment of mood disorders

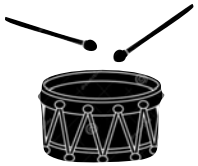
Multimodal measurement batteries & data set

MMBB Music Battery

N = 2000

basic hearing

perception & memory



rhythmic timing

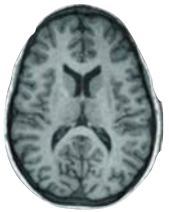
singing production

musical movement

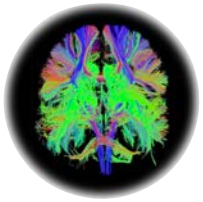
musical emotions

MMBB Brain Battery

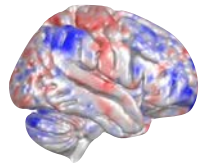
N = 500



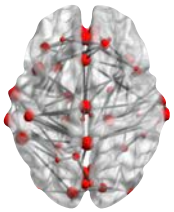
brain morphometry



structural connectivity



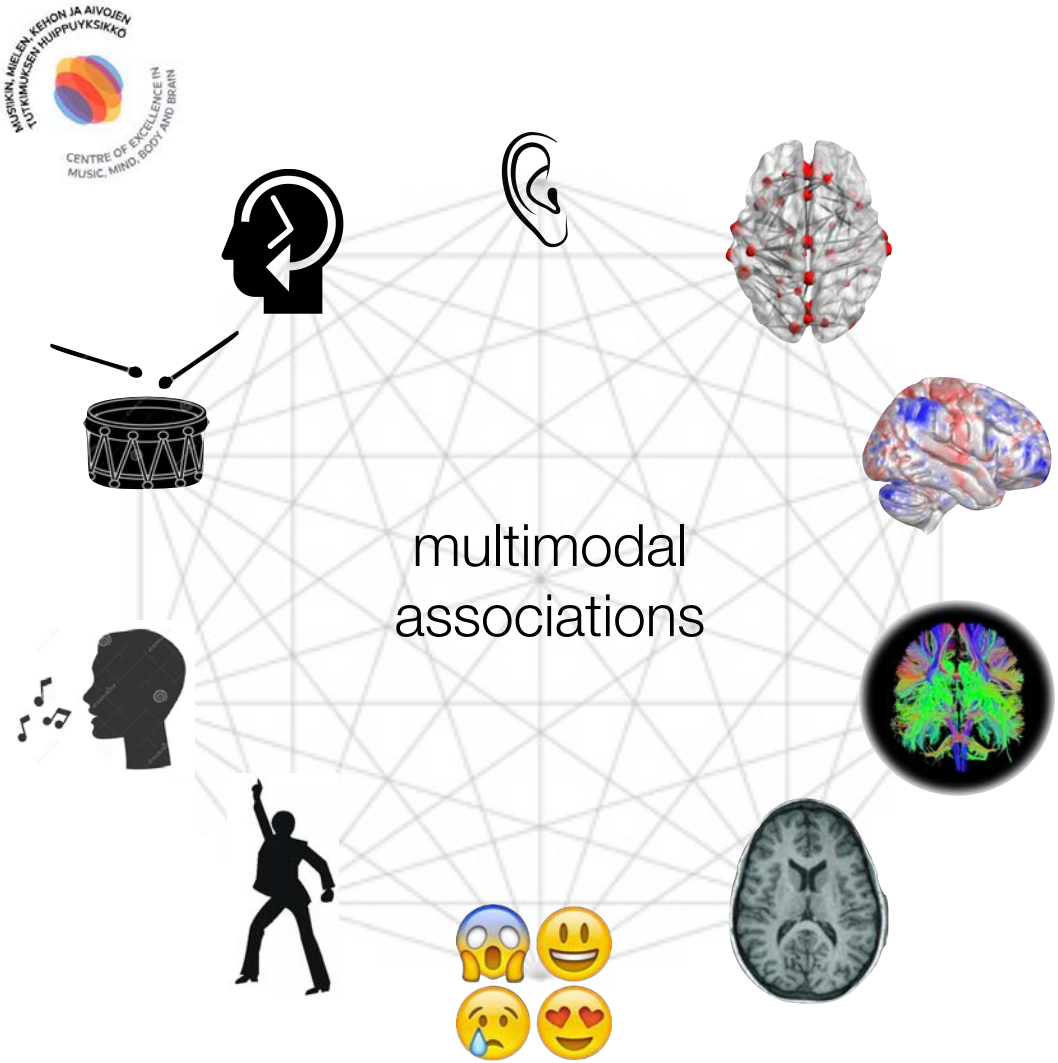
activation (music task & rest)



functional connectivity

5 yrs.

90 yrs.



baselines

Interventions

Pre

Post

mood

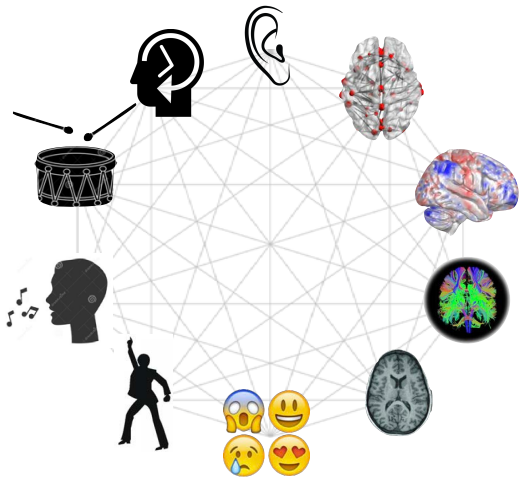
learning

wellbeing

health

motor function

Δ



societal impact

rehabilitation

- collaboration with pediatric, psychiatry, neurology, geriatric units
- optimization of music therapy and rehabilitation methods
- dissemination of findings to stakeholders and public
- integration of methods to training programs

well-being

- development of platforms for teacher training and social emotional skill development
- creating cost-effective interventions to prevent social exclusion, burnout, and sleep-wake disorders

commercial

- development of digital music-based learning and rehabilitation tools together with industrial partners
- improvement of competitiveness in e-learning and e-rehabilitation market



Scientific understanding of music as a biocultural engine of change