



Luxemburg – International Symposium

Neurobiological Aspects of Music Therapy

16th May 2014

Univ.-Prof. Dr. med. Dr. sc. mus. Thomas Stegemann
University of Music and Performing Arts Vienna, Austria

University of Music and Performing Arts Vienna

- Established in 1817
- One of the largest institutions of its kind in the world
- > 3,000 students
- approx. 850 teachers
- 24 institutes

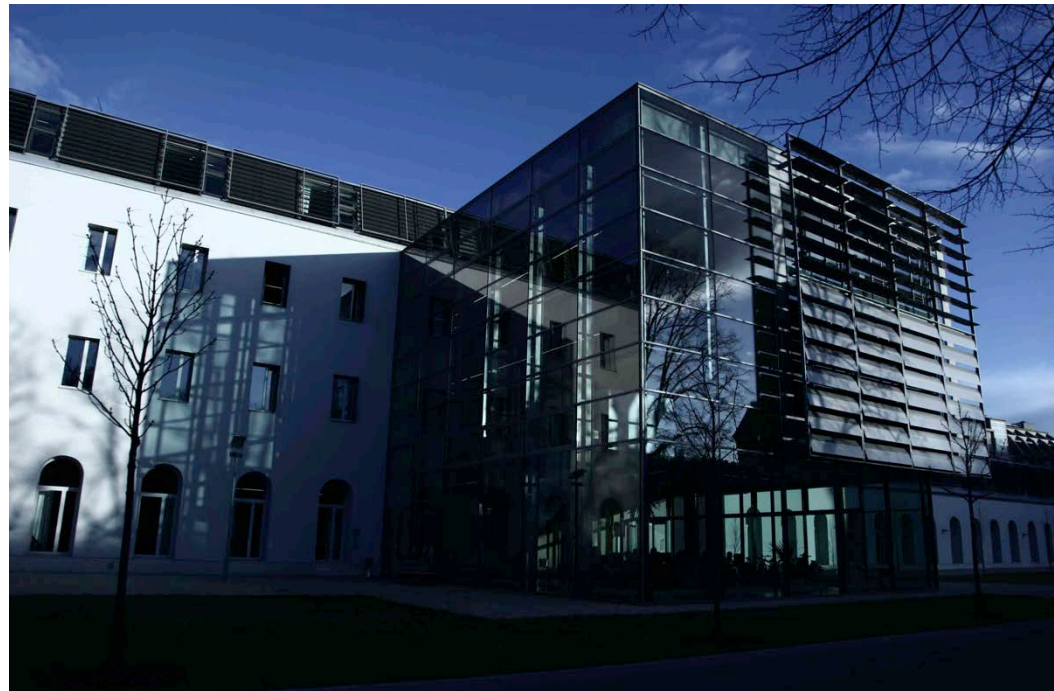


Foto: Soltiz/Minichmayr

www.mdw.ac.at



SAVE THE DATE:
Sat. 18th October 2014
55 years
of music therapy training in
Vienna

Fact Sheet

Music Therapy in Austria



- Austrian Music Therapy Law
(since July 1, 2009)
- 305 registered music therapists
(May 12, 2014)
- 3 music therapy training courses
(Graz, Krems, and Vienna)
- NEW: Doctoral programme (PhD) at the
University of Music and Performing Arts
Vienna, since October 2013

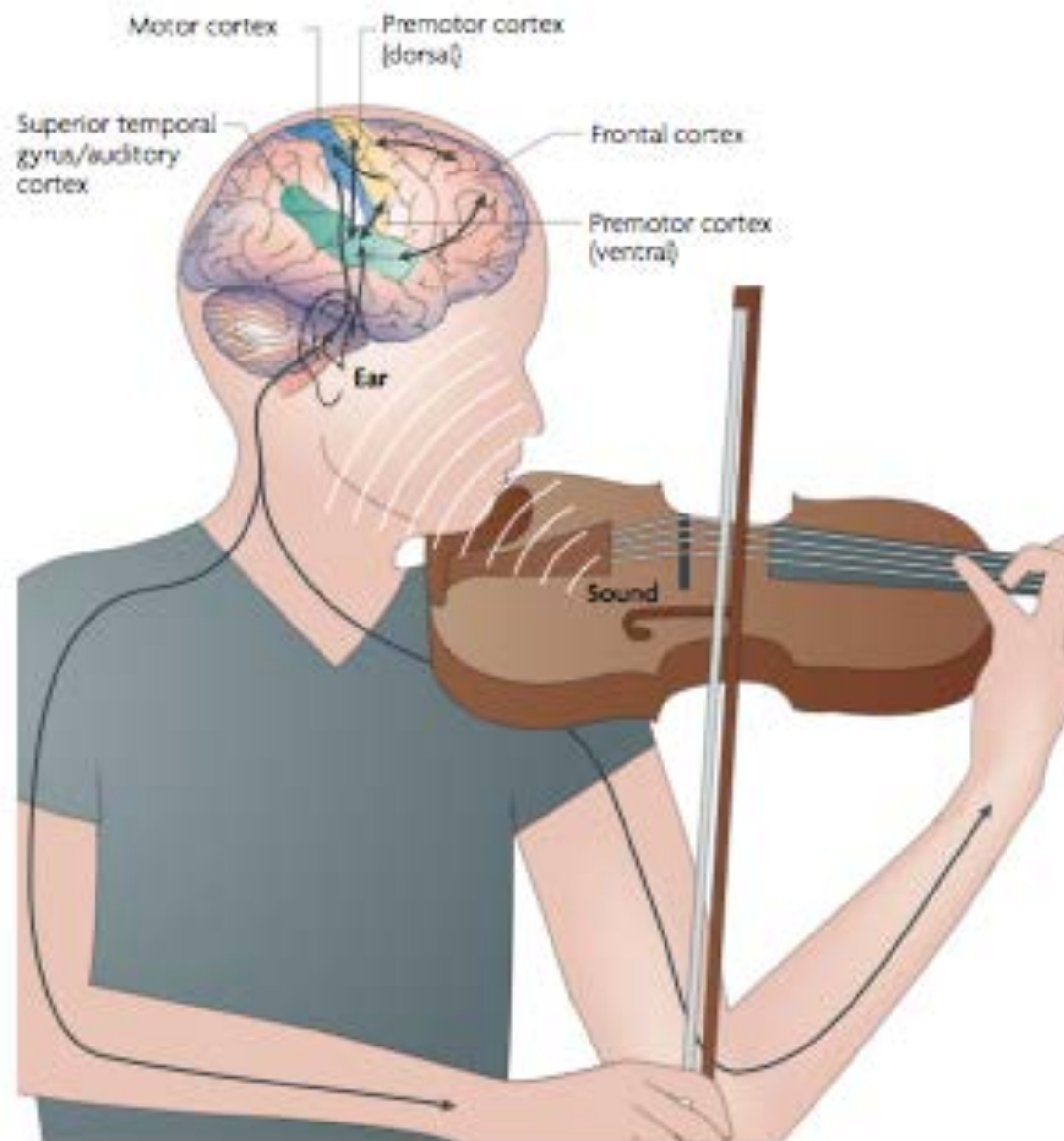
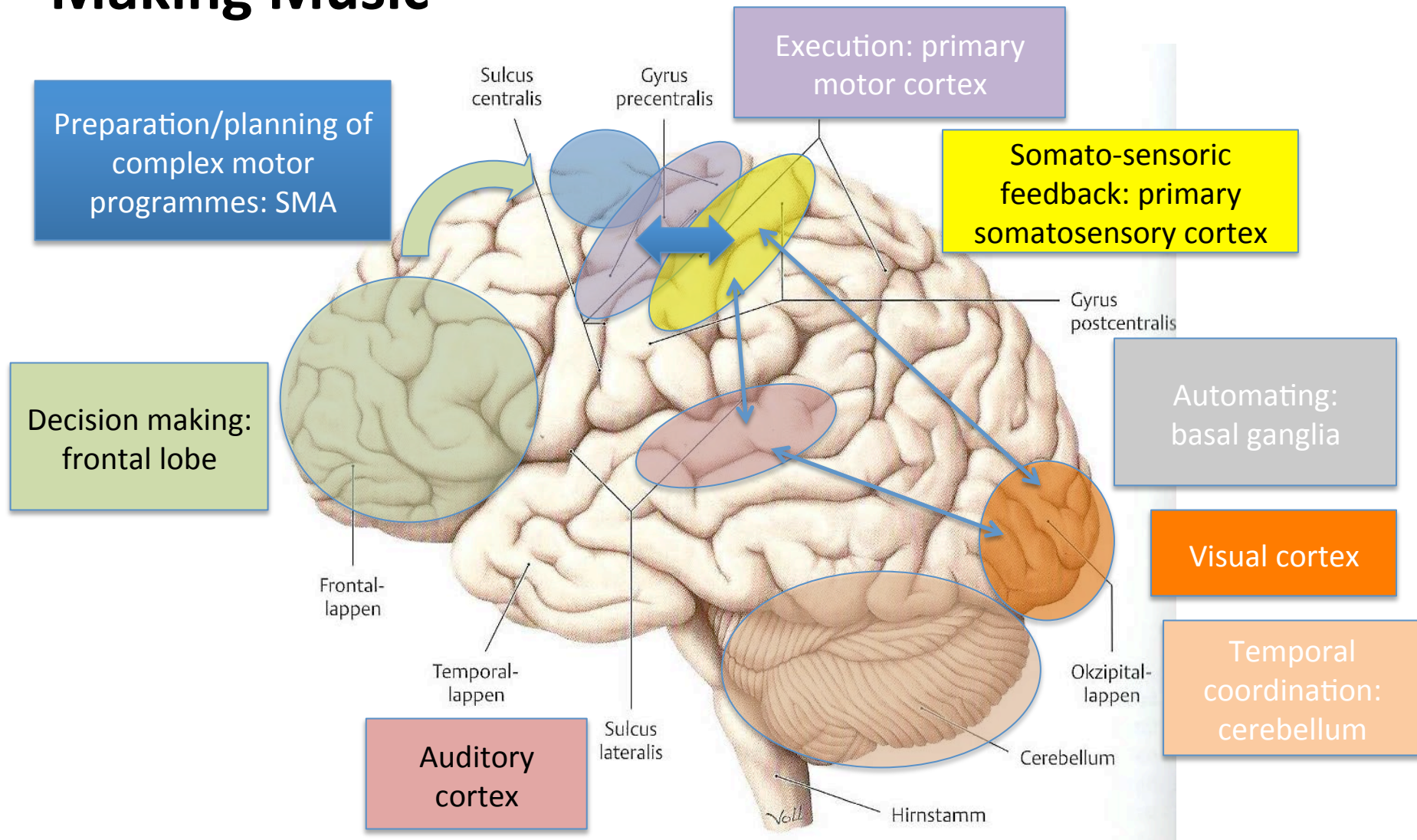


Fig. from Zatorre et al., 2007; S. 548

Making Music

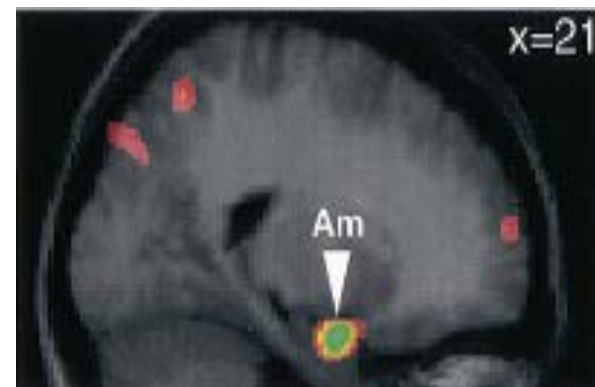
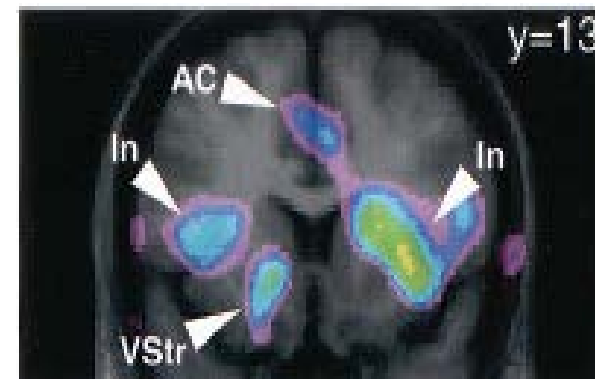
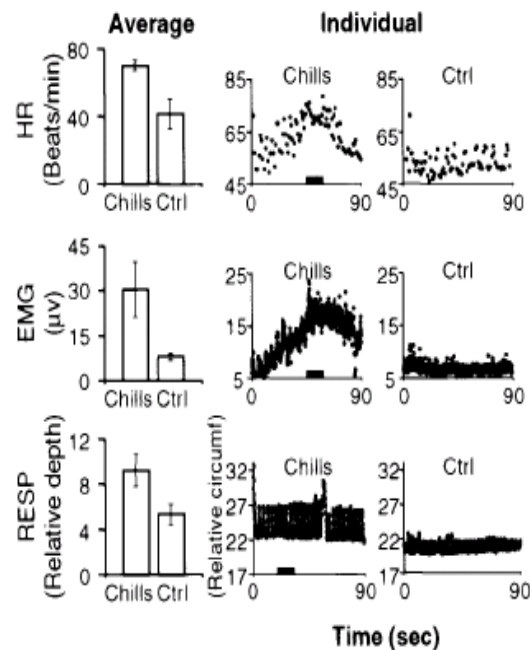


Music and emotions

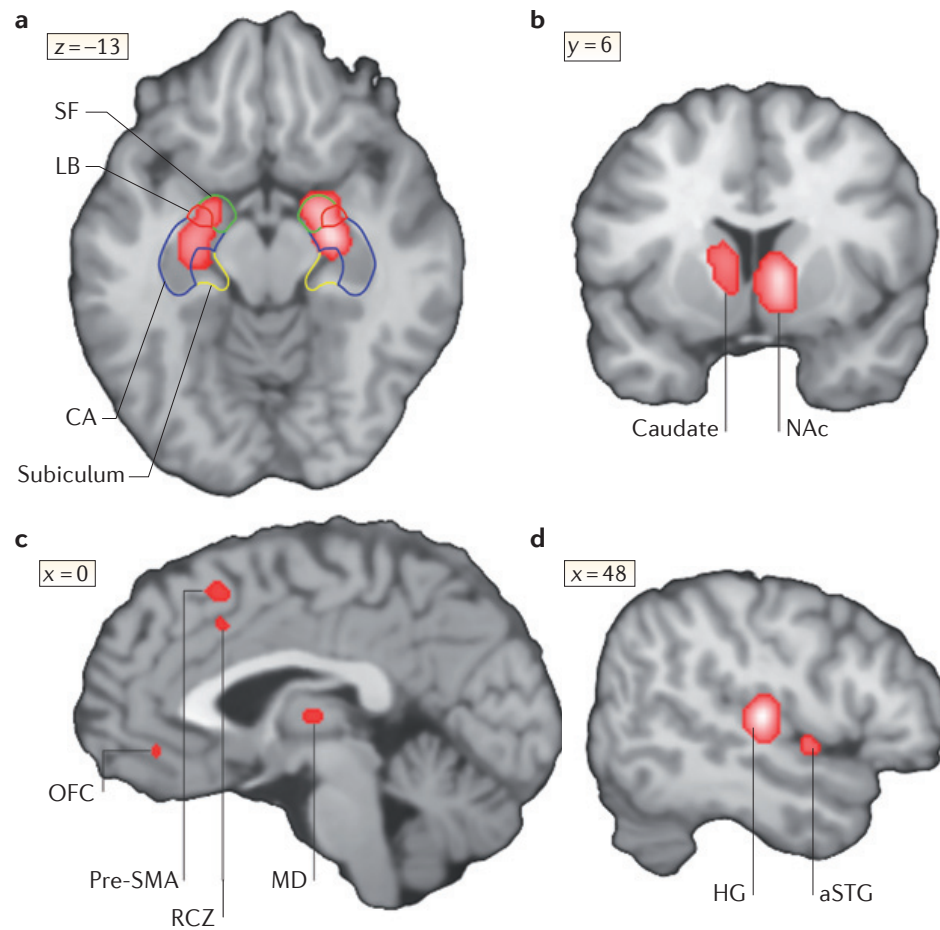
Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion

Anne J. Blood* and Robert J. Zatorre

Montreal Neurological Institute, McGill University, Montreal, QC, Canada H3A 2B4



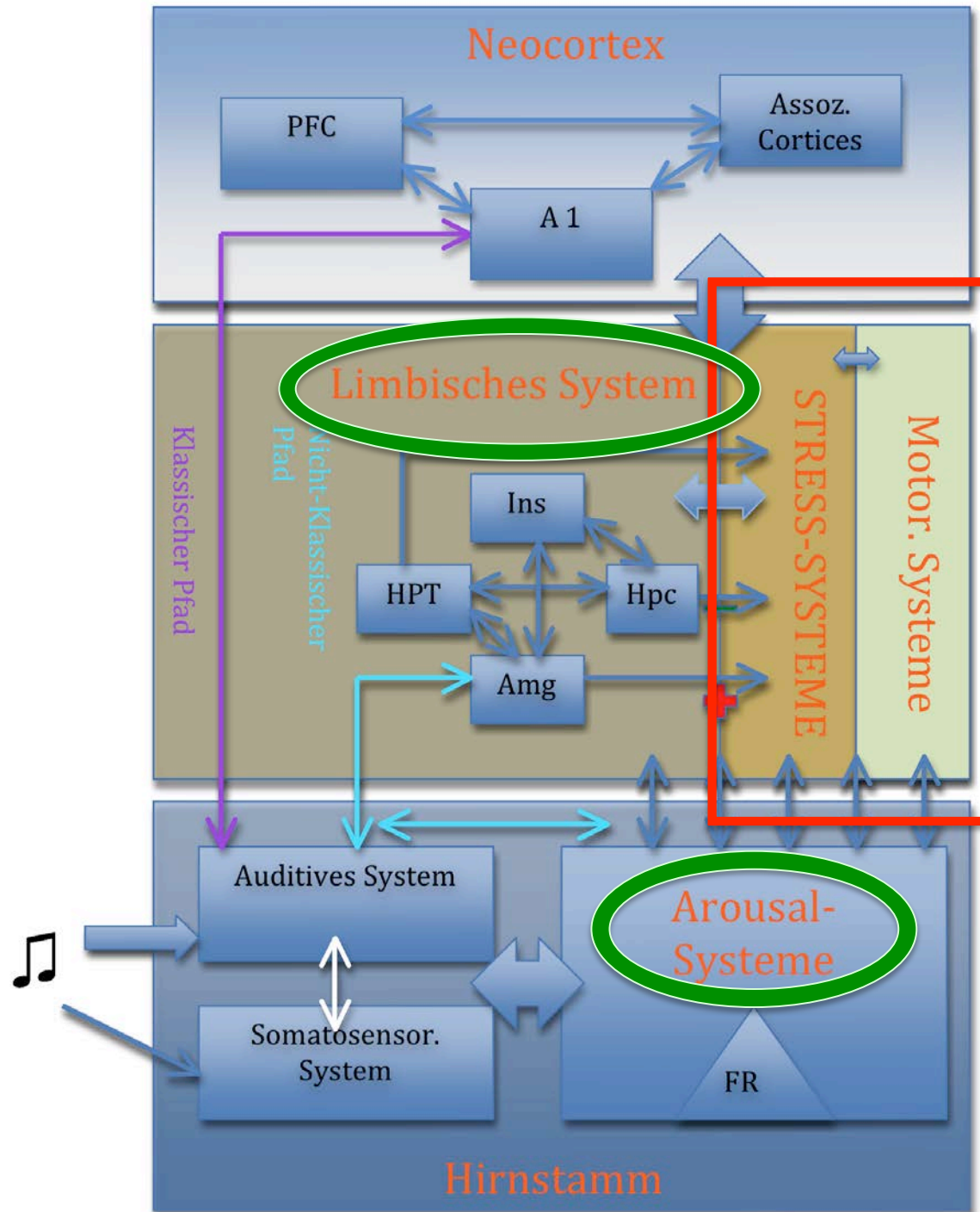
Brain correlates of music-evoked emotions



Stegemann – Luxemburg, 2014

Meta-Analysis
Koelsch, 2014
In: Nature Reviews
Neuroscience
[www.nature.com/
review/neuro](http://www.nature.com/review/neuro)

Stegemann,
2013



Classical and Non-classical Ascending Auditory Pathways

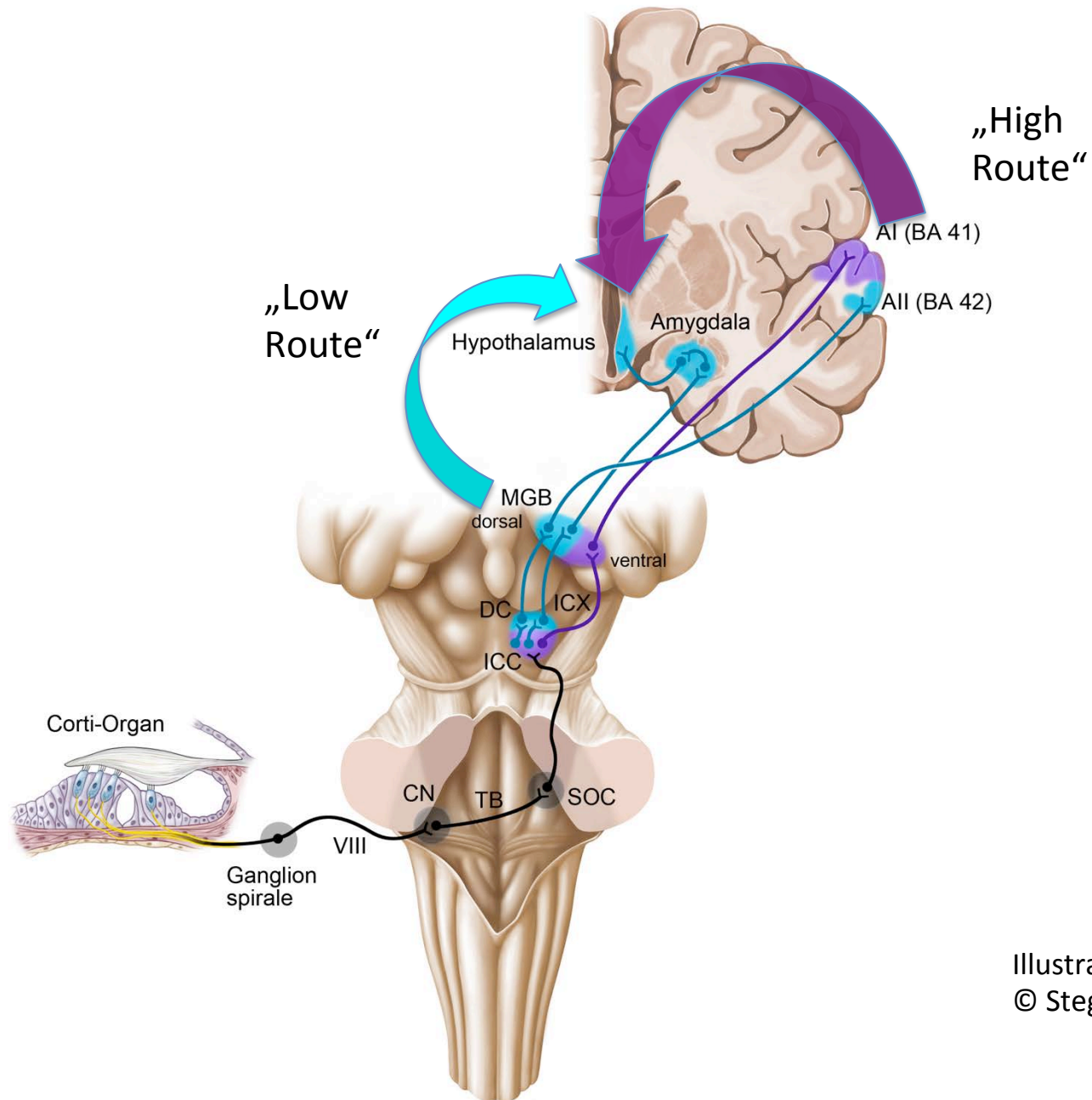
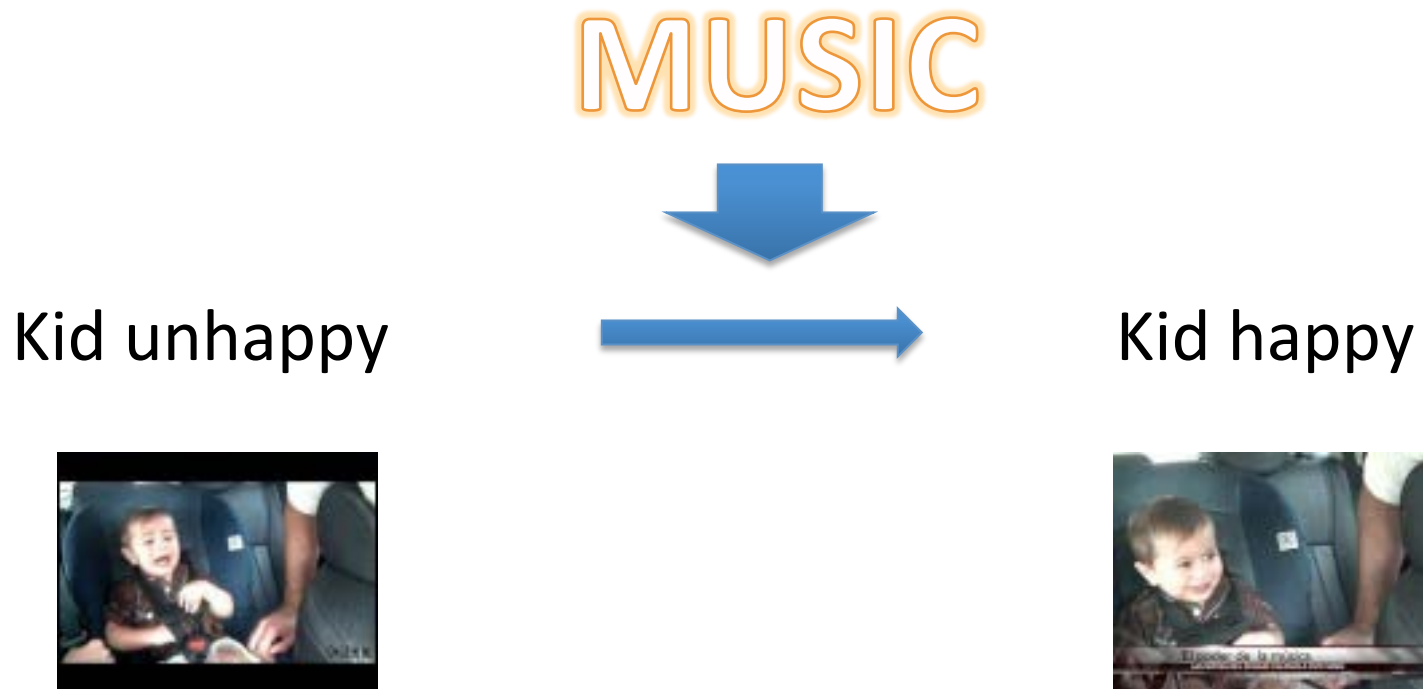


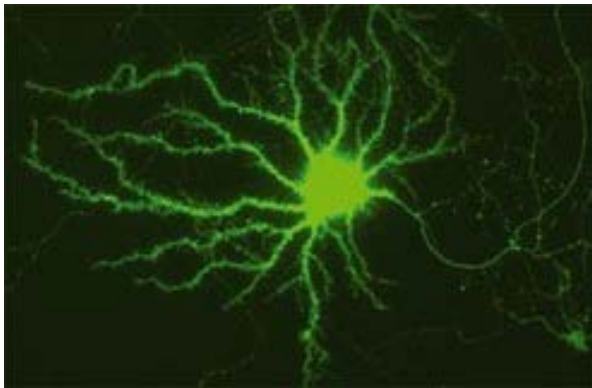
Illustration: Markus Voll
© Stegemann, 2013

How does music therapy work?



<http://www.youtube.com/watch?v=McuLdjL2hh8>

Arts therapies: Underlying mechanisms from a neurobiological perspective



Quelle: www.mpg.de



Quelle: www.welt.de

Neuroplasticity and Learning

Synchronisation

Mirror Neurons

Mechanism 1:

Neuroplasticity und Learning

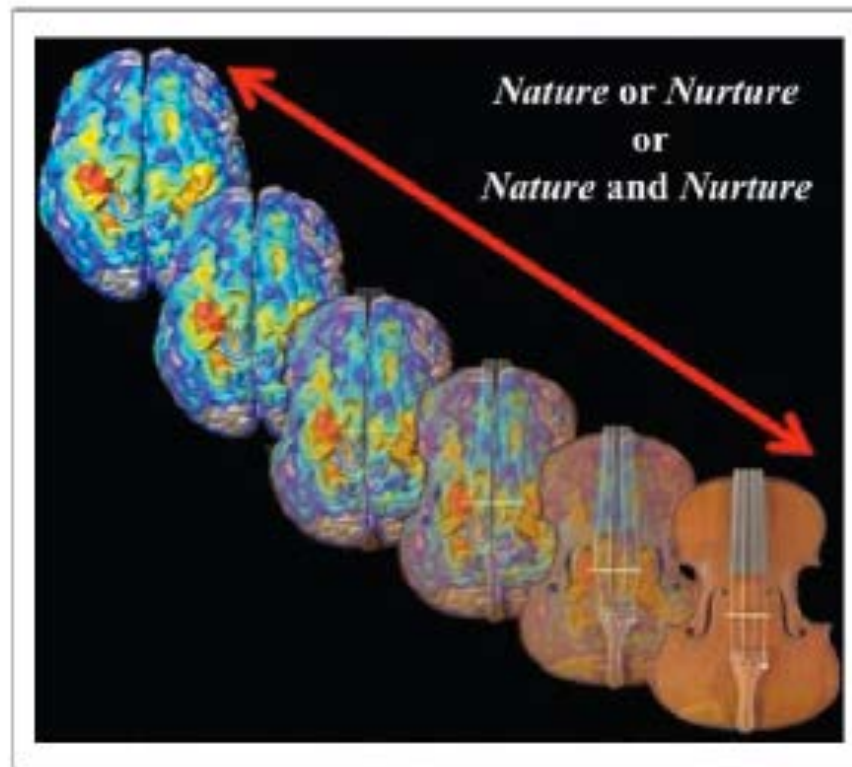
“At the end of the day all changes in therapy rely on changes in the readiness of synaptic transmission. These processes can be strengthened by facilitation; if not used, these connections can be weakened or even inhibited actively. “

„Alle therapeutischen Veränderungen beruhen letztlich auf Veränderungen synaptischer Übertragungsbereitschaften. Die Übertragungsbereitschaften können durch Bahnung verstärkt, durch Nichtbenutzung geschwächt, aber auch aktiv gehemmt werden.“

(Grawe, 2004)

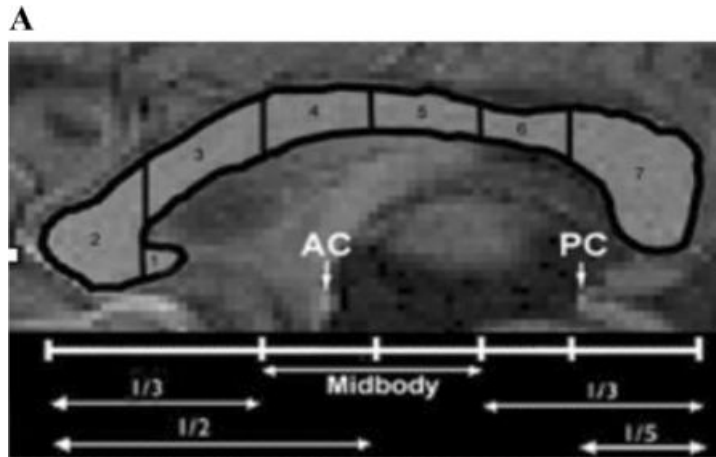
Mechanism 1:

Neuroplasticity und Learning



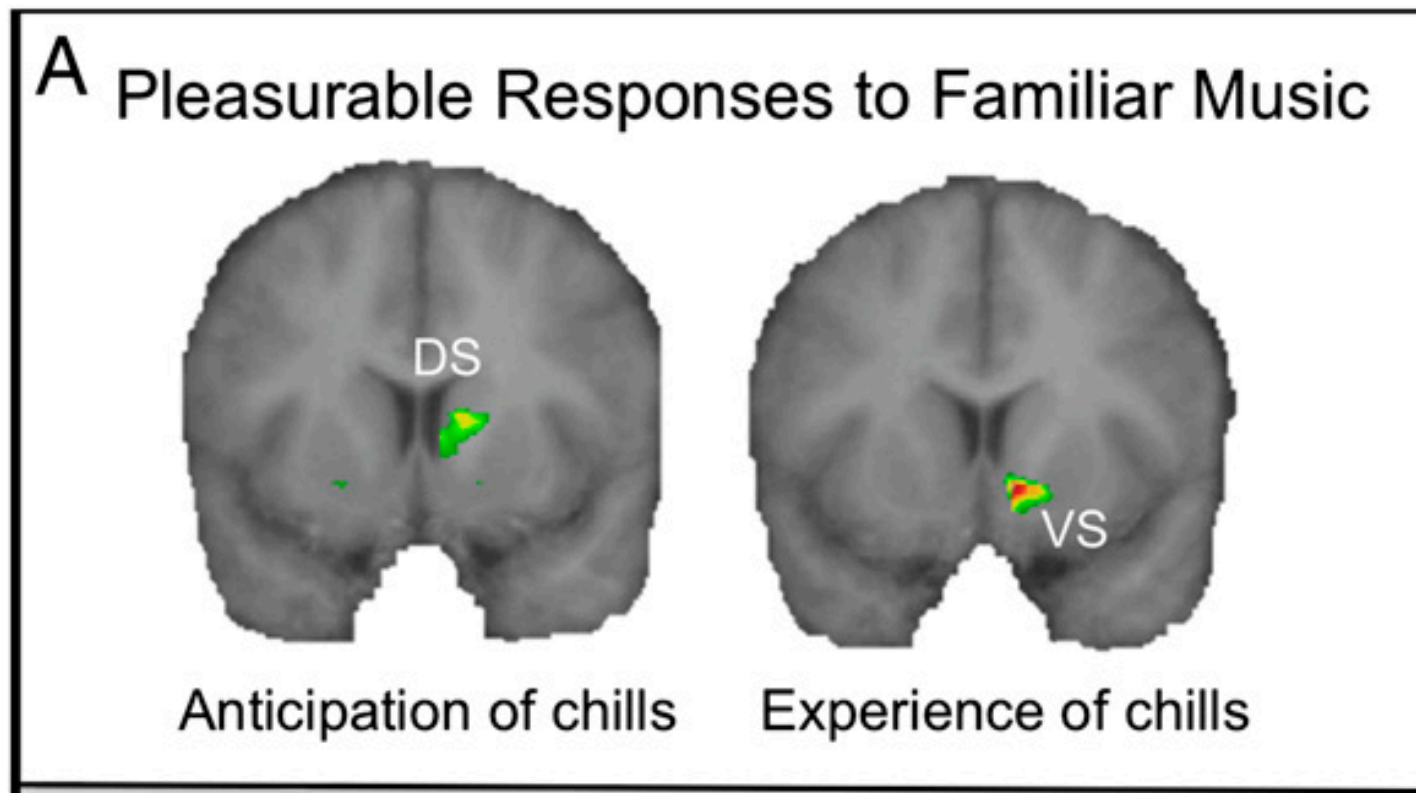
Wan & Schlaug, 2010

Mechanism 1: Neuroplasticity und Learning



Schlaug et al., 2009

Mechanism 1: Neuroplasticity und Learning



Zatorre & Salimpoor, 2013

Mechanism 2

Synchronisation

Mechanism 2

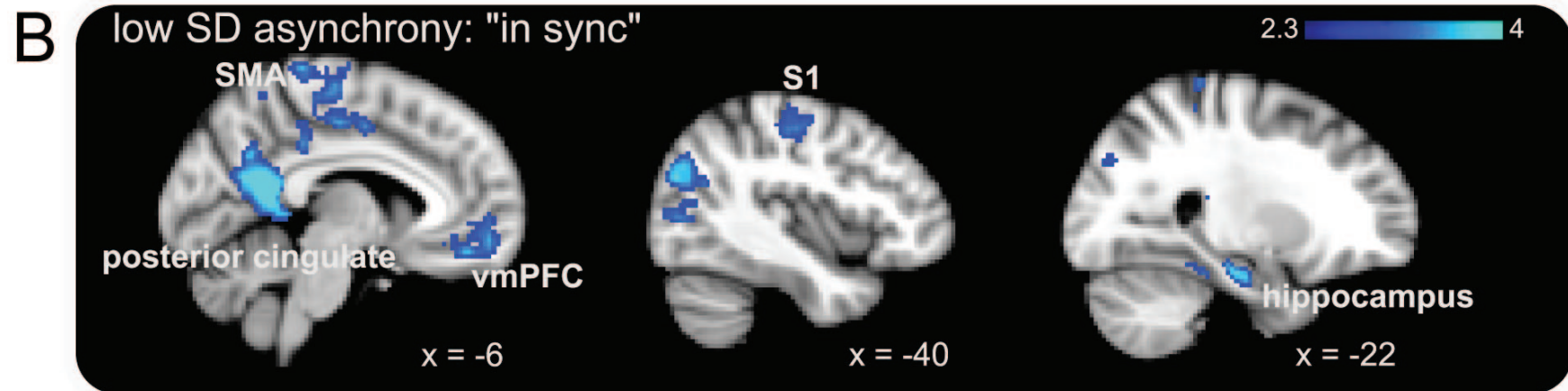
Synchronisation

Cerebral Cortex
doi:10.1093/cercor/bhs243

Being and Feeling in Sync with an Adaptive Virtual Partner: Brain Mechanisms Underlying Dynamic Cooperativity

Merle T. Fairhurst¹, Petr Janata^{2,3} and Peter E. Keller^{1,4}

¹Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany, ²Department of Psychology, ³Center for Mind and Brain, University of California, Davis, CA, and USA ⁴MARCS Institute, University of Western Sydney, Sydney, Australia



Mechanism 2

Synchronisation



BMC Neuroscience



Research article

Open Access

Brains swinging in concert: cortical phase synchronization while playing guitar

Ulman Lindenberger^{*1}, Shu-Chen Li¹, Walter Gruber² and Viktor Müller^{*1}

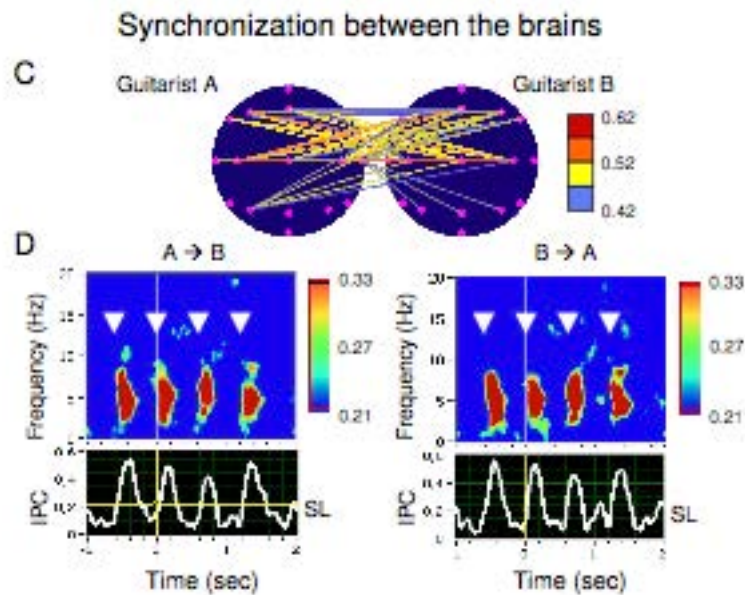
Address: ¹Center for Lifespan Psychology, Max Planck Institute for Human Development, Lentzeallee 94, 14195 Berlin, Germany and ²Department of Physiological Psychology, University of Salzburg, 5020 Salzburg, Austria

Email: Ulman Lindenberger^{*} - lindenberger@mpib-berlin.mpg.de; Shu-Chen Li - shuchen@mpib-berlin.mpg.de; Walter Gruber - walter.r.gruber@sbg.ac.at; Viktor Müller^{*} - vmueller@mpib-berlin.mpg.de

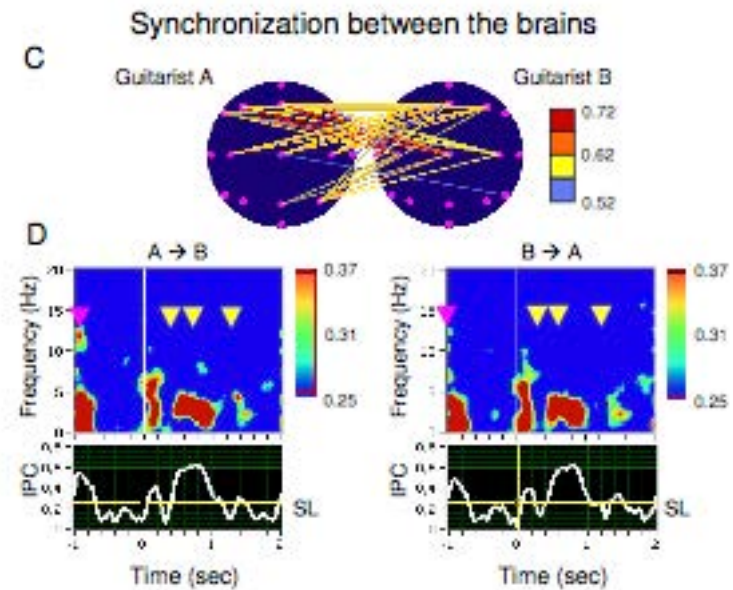
^{*} Corresponding authors

Mechanism 2

Synchronisation



preparatory period



play onset

Mechanism 3

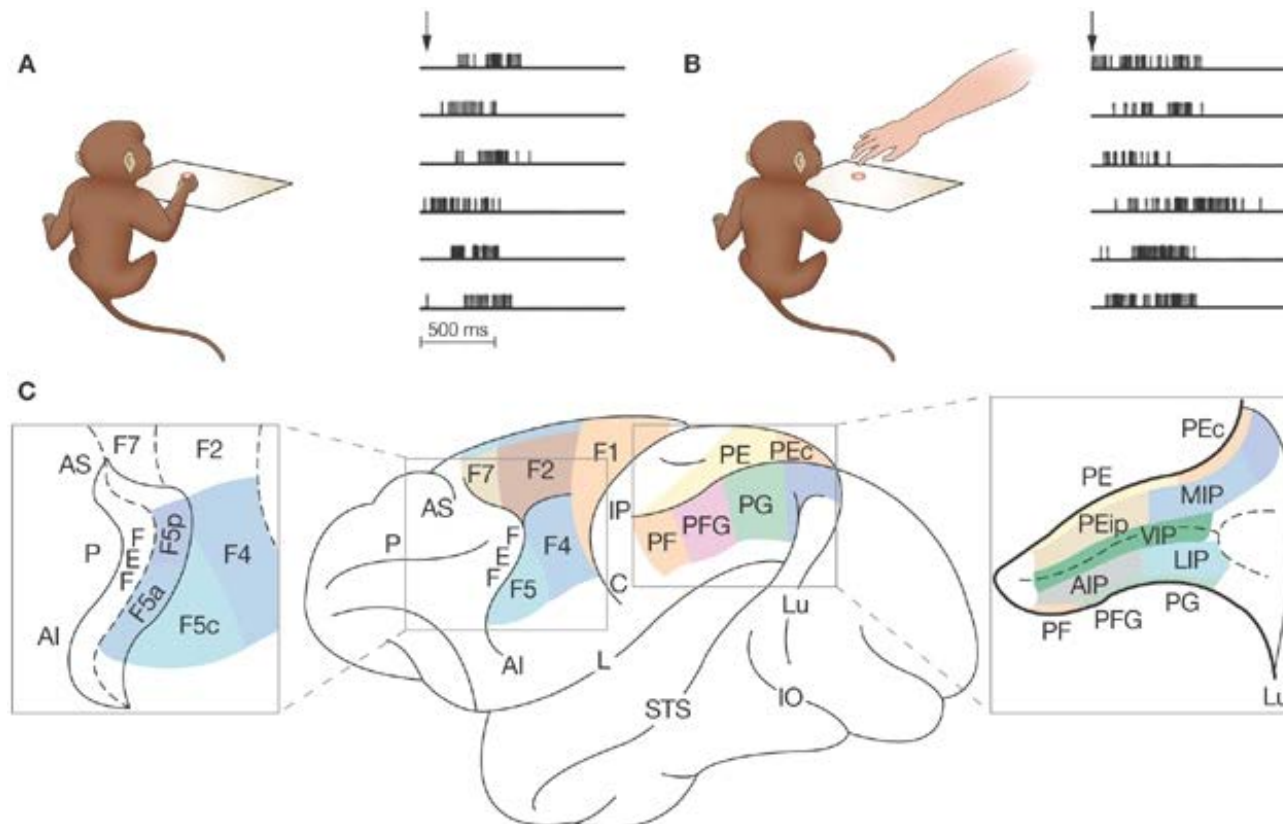
Mirror Neurons

Mechanism 3: Mirror Neurons

“Mirror neurons are highly specialized nerve cells that do not only code goal-related actions by oneself, but also fire when the same action is performed by another individual.”

Stegemann & Geretsegger (in press)

Mechanism 3: Mirror Neurons



Medscape

Source: Nat Clin Pract Neurol © 2009 Nature Publishing Group

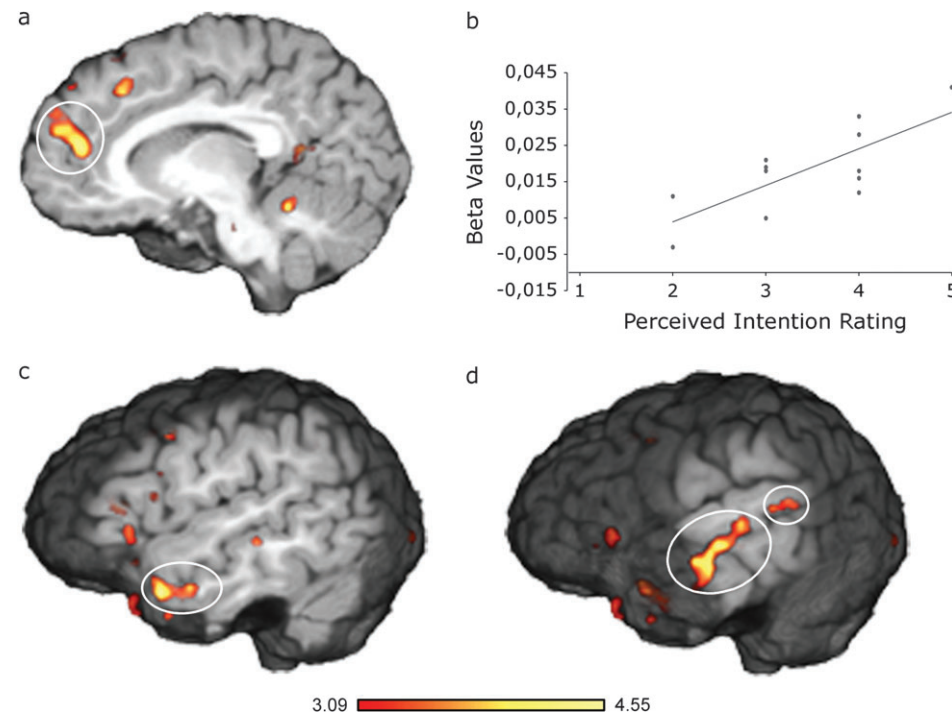
Mechanism 3: Mirror Neurons

Cerebral Cortex March 2009;19:619-623
doi:10.1093/cercor/bhn110
Advance Access publication July 4, 2008

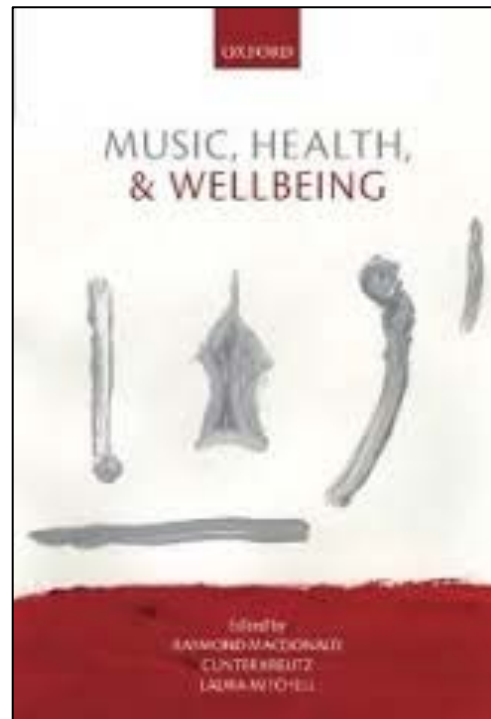
Understanding the Intentions Behind Man-Made Products Elicits Neural Activity in Areas Dedicated to Mental State Attribution

Nikolaus Steinbeis¹ and Stefan Koelsch²

¹Max-Planck Institute for Human Cognitive and Brain Research, Stephanstr 1a, 04103 Leipzig, Germany and ²Department of Psychology, Pevensey Building, University of Sussex, Falmer, Brighton BN1 9QH, UK



Mechanism 3: Mirror Neurons



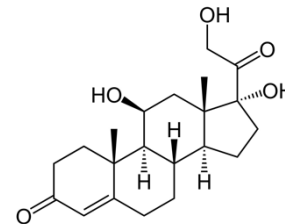
2012

Chapter 29

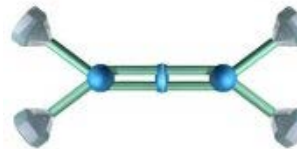
The Brain and Positive Biological Effects in Healthy and Clinical Populations

Stefan Koelsch and Thomas Stegemann

Cortisol



Immunoglobulin A



Stegemann – Luxemburg, 2014

Summary: neurobiological mechanisms in music therapy

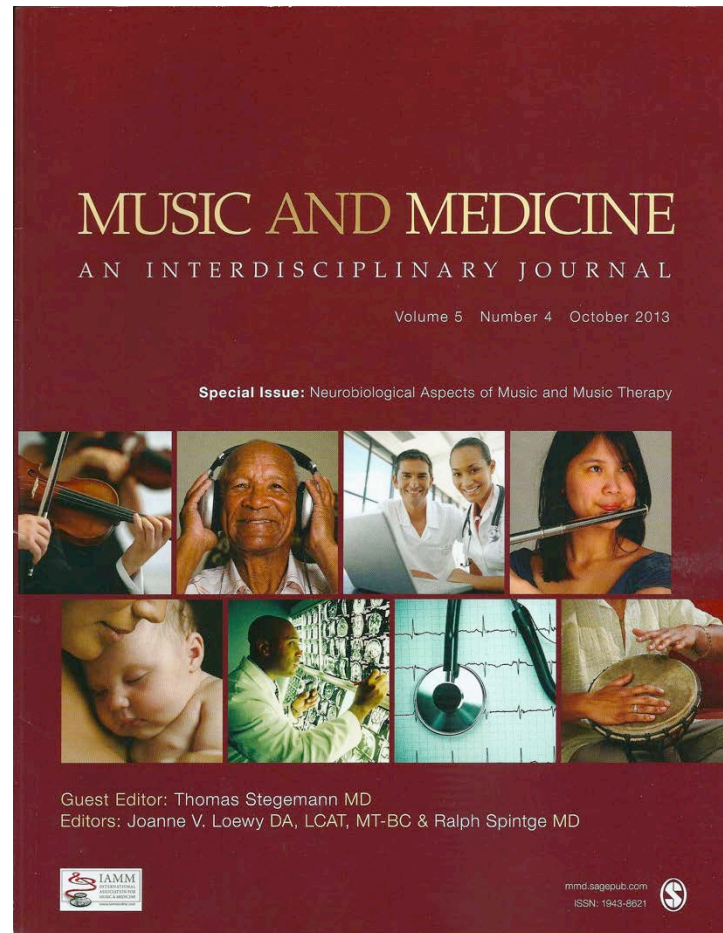
MUSIC...

- is rewarding, thus it facilitates learning and neuroplasticity
- is catching, thus it helps to synchronise in group or dyadic situations
- is social, thus it promotes empathy and group cohesion



® GEO

Clinical implications



SPECIAL ISSUE (2013)

- Stroke
- Parkinson's disease
- Multiple Sclerosis
- Epilepsy
- Dementia
- Autism Spectrum Disorder

Conclusion

We can draw from clinical neuroscience to describe and enhance the therapeutic advantages of arts in action and further illuminate the unique contribution of art therapy to well-being and health.

Noah Hass-Cohen, 2008

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- Stegemann – Luxemburg, 2014

Contact and pdf-copy of slides:

www.thomasstegemann.at

News > Rückblick

Upcoming Events...



World Federation of Music Therapy
Federación Mundial de Musicoterapia

14th World Congress of Music Therapy
Vienna/Krems, Austria

**Cultural Diversity in Music Therapy Practice,
Research and Education**

July 7-12, 2014

10th European Music Therapy Conference
Vienna, Austria

A Symphony of Dialogues

July 5-9, 2016

In cooperation with ÖBM and WIM

**em
tc**