The Royal Academy of Music
Aarhus / Aalborg

THE DANISH NATIONAL RESEARCH FOUNDATION'S
MIB
CENTER FOR MUSIC IN THE BRAIN

Course on Experimental Musicology

Four lectures with Center for Music in the Brain's principal investigators

Time:

August 24th, 1-3:30 PM and August 26th, 9:30-12 AM

Venue:

Kammermusiksalen, Det Jyske Musikkonservatorium, Musikhuset, Aarhus

Wednesday August 24th 1-2 PM

Music Perception

Professor Lauren Stewart
Center for Music in the Brain, Aarhus University and Goldsmiths, University of London

Learning outcomes

Students will gain the following:

a) an understanding of the auditory pathways involved in music perception
b) an understanding of what patients with brain damage can reveal about how music is organized in the brain
c) an understanding of what can and can't be learned from brain imaging methods
d) an understanding of how to design well controlled psychological approaches to investigate music perception

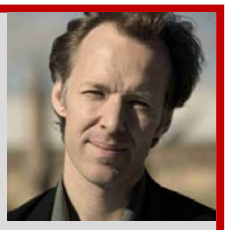
Abstract

Although our perception of music seems effortless, the neural operations involved in constructing meaningful sound from the vibrations arriving at our eardrums represent a highly sophisticated process. This lecture will describe the anatomical pathways and functional properties of the auditory system before moving on to discuss how patients with brain lesions help us to understand how music is processed in the brain and how brain imaging studies can complement this approach. Finally, we will consider some seminal examples of psychological experiments investigating how music is perceived and appreciated and the importance of sound experimental design.

Background literature

1. L. Stewart, K. v. Kriegstein, J. D. Warren and T. D. Griffiths: Music and the brain: disorders of musical listening, Brain 2006
2. Christopher J. Plack: Journey Through the Auditory System. From The Sense of Hearing, Chapter 4, p 62-87. Psychology Press, London, New York, 2009.

Wednesday August 24th 2:10-3:10 PM



Music and Pleasure

Professor Morten L. Kringelbach

Center for Music in the Brain, Aarhus University and Oxford University

Learning outcomes

Students will gain the following:

a) an understanding of pleasure in the human brain
b) an understanding of the main mechanisms of the pleasure cycle: wanting, liking and learning
c) an understanding of mechanisms underlying fundamental and higher order pleasures such as music
d) an understanding of the use of causal whole-brain computational modelling of neuroimaging data in health and disease

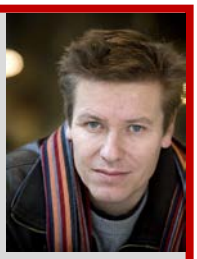
Abstract

Emotion is always valenced – either pleasant or unpleasant – and dependent on the pleasure system. This system serves adaptive evolutionary functions; relying on wanting, liking and learning neural mechanisms mediated by mesocorticolimbic networks driving pleasure cycles with appetitive, consummatory and satiation phases. Liking is generated in a small set of discrete hedonic hotspots and coldspots, while wanting is linked to dopamine and distributed brain networks.
Breakdown of the pleasure cycle can lead to anhedonia, a main characteristic of affective disorders. Eudaimonia and well-being are difficult to study empirically. Yet whole-brain computational models could offer novel insights, e.g. for meaningful routes to Eudaimonia, such as caregiving of infants or music; potentially linking eudaimonia to optimal metastability in the pleasure system.

Background literature

1. Berridge K.C. & Kringelbach M.L. (2015) Pleasure systems in the brain. Neuron 86:646-664. http://www.kringelbach.org/papers/Neuron_BerridgeKringelbach2015.pdf
2. Gebauer L., Kringelbach M.L. & Vuust P. (2015) Predictive coding links perception, action and learning to emotions in music. Physics of Life Review 13:50-52 http://www.kringelbach.org/papers/PLR_Gebauer2015.pdf

Friday August 26th 9:30-10:30



Groove on the brain: rhythmic complexity and predictive coding

Professor Peter Vuust

Center for Music in the Brain and The Royal Academy of Music, Aarhus/Aalborg

Learning outcomes

Students will gain the following:

a) an understanding of the predictive coding of rhythm, groove and polyrhythm
b) an understanding of how rhythm is processed in the brain
c) an understanding of how musical abilities influence brain processing of music
d) an understanding of how different brain imaging methods and analyses techniques can be used to study different aspects of rhythm.

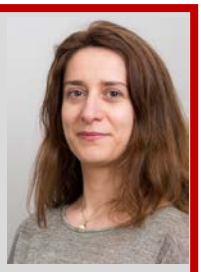
Abstract

Musical rhythm has a remarkable capacity to move our minds and bodies. I will describe how the theory of predictive coding (PC) can be used as a framework for understanding how rhythm and rhythmic complexity are processed in the brain. This theory posits a hierarchical organization of brain responses reflecting fundamental, survival-related mechanisms associated with predicting future events. I review empirical studies of the neural and behavioral effects of syncopation, polyrhythm and groove, and propose how these studies can be seen as special cases of the PC theory. Overall, musical rhythm exploits the brain's general principles of prediction and that the pleasure and desire for sensorimotor synchronization from musical rhythm could be a result of such mechanisms.

Background literature

1. Peter Vuust & Maria A G Witek: Rhythmic complexity and predictive coding: a novel approach to modeling rhythm and meter perception in music, Frontiers in Psychology, 2014.
2. Witek, Maria A G; Clarke, Eric F; Wallentin, Mikkel; Kringelbach, Morten L.; Vuust, Peter. Syncopation, body-movement and pleasure in groove music. PloS one, Vol. 9, Nr. 4, 2014, s. e94446.

Friday August 26th 10:40-11:40



Music and Learning

Professor Elvira Brattico
Center for Music in the Brain, Aarhus University

Learning outcomes

Students will gain the following:

a) an understanding of brain plasticity, a central concept in modern neuroscience
b) a comprehensive and critical view on the current paradigms and protocols in music neuroscience
c) an understanding of the main peculiarities of the musicians' brain
d) an understanding of the neural and behavioral changes following music training that might extend beyond musical skills
e) an understanding of the various biological and environmental factors that determine the impact of music training on the brain

Abstract

The lecture will review the most important findings on brain plasticity derived from music training in childhood and adulthood. A distinction will be made between brain changes that are closely tied to the music skills that have been learned and other changes that might extend beyond those. It will also be emphasized how novel paradigms and protocols in the field might allow a deeper understanding of the multiple biological and environmental factors governing the impact of music on the individual brain.

Background literature

1. Mark Reybrouck and Elvira Brattico: Neuroplasticity beyond Sounds: Neural Adaptations Following Long-Term Musical Aesthetic Experiences, *Brain Sciences, 2015*
2. Ewa A. Miendlarzewska and Wiebke J. Trost: How musical training affects cognitive development: rhythm, reward and other modulating variables. Frontiers in Neuroscience, 2014