HIGHLIGHTS OF THE YEAR

In 2022 we accelerated the pace from 2021 in terms of publications totalling 70 peer-reviewed papers. In particular, we take pride in our review in Nature Reviews Neuroscience, which cements our Predictive Coding of Music (PCM) hypothesis in the neuromusic field as the main comprehensive theory of how music is processed by the brain. PCM remains the fundamental theoretical framework on which the research of the centre is based. This directly influences the paradigms developed by MIB, such as the inverted U-shape of groove, which is now the focus of research at many other groups and institutions worldwide and underlies ground-breaking new results such as the bodily hierarchy discovered in the work of PhD student Signe Hagner.

Adding to PCM's success, Prof. Morten Kringelbach published a number of theoretical papers on dynamical models which are used at MIB to analyze structure–function relationships in brain networks. These and other state-of-the art analysis methods are at the core of the brain scanning experiments which form the majority of MIB's work. This is true for postdoc Leonardo Bonetti's work, which uses magnetoencephalography and brain network analyses to elucidate how musical processing evolves from note to note while the brain is trying to figure out whether it knows the melody or not. Noteworthy is also Associate Professor Massimo Lumaca's Network Analysis of Human Brain Connectivity in relation to musical interaction in signalling games, a unique paradigm he has developed to show the mechanisms as well as the structural and functional brain processing underlying how music is transmitted from person to person over time, from generation to generation.

With the new research plan for the last four years of MIB, much of the research is now directed towards such experiments emphasizing music interaction in the light of the predictive coding theory. Pioneering this work is Professor Peter Keller, who is world leading in this field. Bringing experimental expertise on combined neuroimaging, computational modelling of behaviour, motion capture and modelling of joint interaction in music, he is key to the future of this line of research at MIB. This fortifies MIB's ambition of understanding the brain mechanisms underlying music's ability to unite people, which may be the evolutionary function of music. This research taps into the most fundamental questions in the biological study of music: Why do we have music in the first place? Animals only have parts of the cognitive abilities for making and understanding music. In the beginning of 2022, we were very happy to be joined by one of the leading experts in this field, Associate Professor Andrea Ravignani. Ravignani's seminal work on the evolutionary and biological bases of rhythm cognition and flexible sound production, and the role they played in the origins of music and speech in our species is a perfect fit for MIB and broadens the scope of our research towards the more fundamental biological questions about music.

We put a lot of efforts in translating the insights from basic research into brain processing of music into a more clinical context. This is evidenced by our 2014 White Paper entitled "Music interventions in health care" which was subjected to a major update revision in 2022. This book covers a wide range of interventions from the use of music for pain relief and improving insomnia to music interventions in the rehabilitation of Parkinson's patients or for improving sports performance and will help guide health care personnel as well as policy makers in the use of music in health care.

In June 2022, Nadia Høgholt defended her thesis on changes in brain and behaviour in new parents. She has continued her clinical career as a medical doctor at Randers Regionshospital. Later in June, Mette Kaasgaard defended her thesis about Singing in Pulmonary Rehabilitation of Patients with Chronic Obstructive Pulmonary Disease. She is continuing her research in a postdoctoral position at Næstved Sygehus. We welcomed two new PhD students: Ana Teresa Queiroga and Pelle De Deckere.

In this annual report, we wish to highlight MIB's new research plan, by structuring it according to the new themes introduced in the plan: 1) refining and developing Predictive Coding of Music, 2) multimodal theme, 3) music interactions theme, 4) meaning of music theme. We hope that this may give the reader a fresh look at our research and help ourselves to further conceptualize these new lines of research at the centre.

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