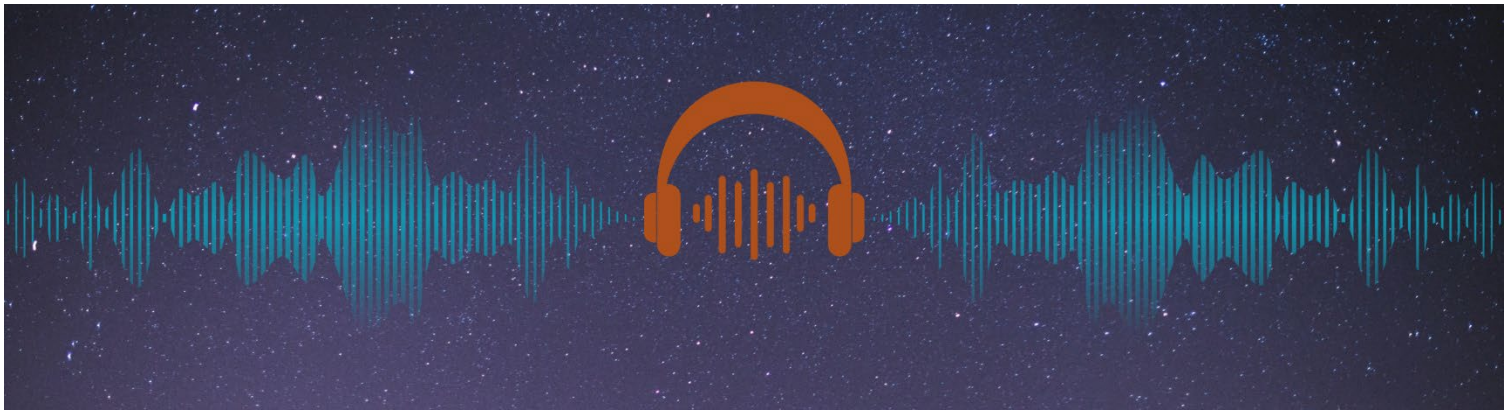
Book of Abstracts

International Conference on Music and Sleep

Interdisciplinary Perspectives

May 6-8, 2026

Center for Music in the Brain, Aarhus University, Denmark



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Welcome from the Chair

Dear Participants of the International Conference on Music and Sleep,

On behalf of the Organizing Committee, we are delighted to welcome you to the *International Conference on Music and Sleep*. We sincerely thank you for joining us in Aarhus and for contributing to this first collective step toward sharing knowledge and bringing together the growing interdisciplinary field of music and sleep research.

The conference is organized by the Center for Music in the Brain at Aarhus University in collaboration with the Royal Academy of Music (Aarhus/Aalborg) and the EU MSCA doctoral network *Lullabyte*. We are also grateful for the generous support from the Lundbeck Foundation and the Carlsberg Foundation, which has contributed to the realization of this conference.

Research on music and sleep has expanded considerably in recent years, spanning clinical studies, neuroscience, psychology, music research, technology, and artistic practice. At the same time, the field remains somewhat fragmented across disciplines and traditions. One of the central motivations for this conference is therefore to provide a shared forum where different perspectives can meet, exchange ideas, and contribute to the development of a more coherent research community.

We would like to express our sincere gratitude to all who submitted abstracts and will present their work during the conference. Your contributions form the core of the scientific programme.

As the first international conference devoted specifically to music and sleep, we look forward to three days of inspiring presentations, rigorous discussions, and new insights into the many intersections between music and sleep.

We wish you a stimulating and rewarding conference.

Kira Vibe Jespersen

On behalf of the Organizing Committee

Reviewers

Thank you to all our reviewers for your vital contribution to International Conference of Music and Sleep:

Miriam Akkermann, Freie Universität Berlin, Germany

Thomas Andrillon, Paris Brain Institute, France

Leonardo Bonetti, Center for Music in the Brain, Aarhus University, Denmark

Alexandre Celma-Miralles, Center for Music in the Brain, Aarhus University, Denmark

Martin Dresler, Donders Institute for Brain, Cognition and Behaviour, Radboud University, The Netherlands

Perfecto Herrera, Universitat Pompeu Fabra, Spain

Sergi Jorda, Universitat Pompeu Fabra, Spain

Boris Kleber, Center for Music in the Brain, Aarhus University, Denmark

Cecilie Møller, Center for Music in the Brain, Aarhus University, Denmark

Victor Pando-Naude, Center for Music in the Brain, Aarhus University, Denmark

Sandra Pauletto, KTH Royal Institute of Technology, Sweden

Bjørn Petersen, Center for Music in the Brain, Aarhus University, Denmark

Björn Rasch, University of Fribourg, Switzerland

Jan Stupacher, Center for Music in the Brain, Aarhus University, Denmark

Anna Zamorano, Center for Music in the Brain, Aarhus University, Denmark

Support

The International Conference on Music and Sleep 2026 is generously supported by the Carlsberg Foundation, the Lundbeck Foundation, Center for Music in the Brain, Aarhus University and the Royal Academy of Music, Aarhus/Aalborg. We extend our deepest gratitude for making the Conference on Music and Sleep possible.

Programme Day 1

Wednesday May 6th

Time	Activity	Location
09.00 – 09.45	Morning coffee and registration	Foyer
09.45 – 10.00	Opening remarks	Chamber music hall
10.00 – 11.00	**Welcome lecture** Professor Peter Vuust The neuroscience of music	Chamber music hall
11.00 – 11.30	Coffee break	Foyer
11.30 – 11.45	**Musical interlude 1** Bloom (Sarah Solow, vocals, & Tobias Møller, guitar)	Chamber music hall
11.45 – 13.00	**Talk Session 1: Music as a sleep aid** **Chair: Miriam Akkermann** • Jason Doescher: Impacts of guided audio interventions on sleep quality: A distributed longitudinal pilot study • Leonardo Muller-Rodriguez: Measuring objective and subjective sleep quality in informal dementia caregivers with bedtime music: A feasibility reversal case series • Kira Vibe Jespersen: How can music aid sleep? A framework for understanding the psychobiological mechanisms underlying the effect of music as a sleep aid	Chamber music hall
13.00 – 14.15	Lunch	RAMA 4th floor
14.15 – 15.00	**Poster Session 1** Mixed topic poster session	Chamber music hall
15.00 – 15.30	Coffee break	Foyer
15.30 – 17.00	**Workshop 1: Music for sleep in hospitals** • Helle Nystrup Lund, Aalborg University Hospital • Line Malmskov, Bispebjerg Hospital	
17.00 – 18.30	Welcome reception	RAMA 4th floor and terrasse
20.00 – 21.30	**Somnosphere** Audiovisual installation created by the Lullabyte Doctoral Candidates.	Chamber music hall

Programme Day 2

Thursday May 7th

Time	Activity	Location
09.00 – 10.00	**Keynote Lecture 1** Professor Mélanie Strauss When the Sleeping Brain Keeps Listening: Predictive Coding of Sound Across Sleep	Chamber music hall
10.00 – 11.00	**Talk Session 2: Home use of sleep music** **Chair: Sandra Pauletto** • Rory Kirk: The reasons and aims for listening to music for sleep: results from an ESM study • Silvia Genovese: The Influence of Individual Factors on the Choice of Sleep Music: Modelling Musical Features of Sleep Music from Demographics, Music Preferences and Habits, and Psychological Factors	Chamber music hall
11.00 – 11.30	Coffee break	Foyer
11.30 – 11.45	**Musical interlude 2** Rebecca Vats Jonsson, classical guitar	Chamber music hall
11.45 – 13.00	**Talk Session 3: Sleep music neuroscience** **Chair: Björn Rasch** • Michelle George: Investigating Perceptual Transformation and Implicit Memory Formation using the Speech-to-Song illusion in NREM Sleep • Annika Parmann: The Influences of Musical Preferences on Brain Responses During Sleep • Alexandre Celma-Miralles: Nap time with music! Neural synchronization to music in sleep-onset insomnia patients	Chamber music hall
13.00 – 14.15	Lunch	RAMA 4th floor
14.15 – 15.00	**Poster Session 2** Mixed topic poster session	Chamber music hall
15.00 – 15.30	Coffee break	Foyer
15.30 – 17.00	**Workshop 2: SLUMBER: A Framework for Home-Based Sleep Experiments Offering Dynamic Delivery of Auditory Stimuli** • Tinke van Buijtene, Universitat Pompeu Fabra • Samuel Morgan, University of Stuttgart • Ali Saberi, Radboud University Medical Center	Chamber music hall
19.00 – 22.00	Conference dinner at MALT	Ceresbyen 68c, Aarhus C

Programme Day 3

Friday May 8th

Time	Activity	Location
09.00 – 10.00	**Keynote Lecture 2** Professor Marcus Pierce Learning to listen, Listening to learn: Modelling musical perception and pleasure	Chamber music hall
10.00 – 11.00	**Talk Session 4: Sleep music analysis** **Chair: Dirk Pflüger** • Jonathan Stumber: Sleep Music Revisited: Open-Source Audio Feature Analysis of Universal Patterns and Subgroups • Tristan O'Leary: Sounding a Safe Space: Exploring the Spatial Experience of Music for Sleep	Chamber music hall
11.00 – 11.30	Coffee break	Foyer
11.30 – 12.45	**Talk Session 5: Lullabies** **Chair: Perfecto Herrera** • Sunday Akande: Auditory Perception, Sleep, and Yoruba Folk Lullabies: A Cultural and Sound-Analytical Study • Franziska Weigert: Lullaby formula(s) – Music-Analytical Explorations of German Lullabies from the Long 19th Century • Miriam Akkermann: « Lullabies of Berlin » – a mirror of cultural memory and a bridge to lullaby singing practices	Chamber music hall
12.45 – 13.00	**Concluding remarks**	Chamber music hall
13.00 – 14.00	Lunch and goodbye	RAMA

Keynotes

Wednesday May 6, 10.00-11.00

Professor Peter Vuust
Center for Music in the Brain, Aarhus University.

Title: Music in the brain - predictive processing of music

Abstract: This presentation examines how music engages the human brain through predictive processing and how these mechanisms can be translated into clinical and everyday applications, with particular relevance to sleep, stress regulation, movement, and well-being. Drawing on research from the Center for Music in the Brain, it argues that music is not only an auditory phenomenon, but also a fundamentally embodied, emotional, social, and learning-based process. The talk outlines how predictive coding helps explain responses to rhythm, melody, and harmony, including why moderate complexity and syncopation can optimize pleasure and the urge to move. Clinical perspectives are highlighted across conditions such as insomnia, Parkinson's disease, autism, cochlear implantation, pain, and stress-related states. Special attention is given to the use of music for relaxation and sleep, where slow, familiar, quiet, and minimally surprising music may be especially beneficial. Across these domains, the presentation emphasizes that effective use of music requires balancing universal mechanisms with cultural background and individual differences. Overall, the talk presents music as a powerful predictive, affective, and therapeutic resource with broad implications for neuroscience, health care, and sleep-related interventions.

Bio: Professor Peter Vuust, PhD, is director of Center for Music in the Brain. He holds joint appointments as professor at the Danish Royal Academy of Music and Department of Clinical Medicine, Aarhus University. He obtained his doctoral degree from the Medical Faculty of Aarhus University in addition to his M.Sc. in mathematics, French and music. He has published highly cited articles on music in the brain, using state-of-the-art brain scanning techniques such as fMRI, PET, EEG, MEG and behavioral measures and has written three monograph's "Polyrhythm and –meter in modern jazz; a study of Miles Davis' Quintet from the 1960s", "Musik på Hjernen" og "Fra Solo til Samspil". He is Denmark's leading expert in the field of music and the brain.
In addition, Prof Vuust is a renowned jazz bassist and composer; leading the Peter Vuust Quartet with Alex Riel, Lars Jansson and Ove Ingemarsson of which seven records have been released so far. He has also played on more than 100 recordings and been sideman with international jazz stars such as Tim Hagans, John Abercrombie, Dave Liebman and many more. He is the recipient of the 2009 Jazz Society of Aarhus' "Gaffel"-prize. His album "September Song" was widely acclaimed by reviewers and received a nomination for a Danish Music Award in 2014.

Thursday May 7, 9.00-10.00

Professor Mélanie Strauss
Université libre de Bruxelles (ULB), Belgium

Title: When the Sleeping Brain Keeps Listening: Predictive Coding of Sound Across Sleep

Abstract: When exposed to an auditory sequence, the brain functions as a predictive-coding device, extracting regularities in the transition probabilities between sounds and detecting unexpected deviations from these patterns. But does such prediction require conscious vigilance, or can it continue to unfold automatically during sleep?

In this presentation, we will explore how the mismatch negativity (MMN) and P300 components of the auditory event-related potential—reflecting two hierarchical stages of auditory novelty detection—are differentially affected by

sleep. We will also describe the descent into sleep and examine how predictive coding capabilities evolve with the loss of conscious access to auditory stimuli.

Bio: Dr. Mélanie Strauss is a neurologist and sleep researcher at the Université libre de Bruxelles (ULB), Belgium, where she heads the multidisciplinary Sleep Unit and the Scientific Program of the Integrated Memory Clinic at Hôpital Universitaire de Bruxelles. She is also Professor of Neurology and Sleep Medicine and FNRS Researcher at the Experimental Neurology Lab (ULB). Her research focuses on the neural dynamics of sleep, vigilance, and cognition, combining EEG, MEG, and multimodal neuroimaging to explore sleep onset, memory consolidation, and early markers of neurodegenerative disease. Dr. Strauss also serves on the scientific board of the French Sleep Research Society (SFRMS) and the advisory board of the Belgian Association for Sleep Research and Sleep Medicine (BASS).

Friday May 8, 9.00-10.00

Marcus Pearce
Queen Mary University of London

Title: Learning to listen, Listening to learn: Modelling musical perception and pleasure

Abstract: Music is universal across human societies and, alongside speech, forms a central cultural component of auditory experience. And yet it is only recently that we have begun to understand the process of learning across the lifespan that enables enculturated listeners to perceive and appreciate the music of their cultures. This understanding depends on computational modelling of the psychological mechanisms involved. Of particular interest is the mechanism of expectation: an obligatory process in which the brain generates predictions for what will happen next based on learning of patterns in previous experience. In musical listening, expectations are generated for both the pitch and timing of musical events as well as more abstract musical structure such as harmonic movement. These expectations reflect both the lifetime musical experience of the listener held in long-term memory as well as local learning of repeated patterns within the current listening episode, held in short-term memory. Expectations also influence perception of musical complexity with more unpredictable music being perceived as more complex than more predictable music. These effects of expectation on perceived complexity in turn influence experience of affect and pleasure when listening to music. Greater unpredictability is associated with heightened arousal assessed both subjectively and physiologically. Pleasure meanwhile shows an inverted-U shaped relationship with unpredictability such that intermediate levels of unpredictability evoke greatest pleasure. This can be related to an underlying mechanism of learning progress in which our brains take pleasure in learning the structure of a piece of music such that simple, predictable music fails to support sustained learning while complex, unpredictable music fails to support a sufficiently high learning rate. The optimal levels of predictability will depend both on the individual and the context.

Bio: Marcus Pearce is Reader in Cognitive Science at Queen Mary University of London and Honorary Professor of Neuroscience at Aarhus University, Denmark. He has published more than 80 journal articles on auditory perception and cognition as well as the entry on Music Perception in the Oxford Research Encyclopedia of Psychology and the research monograph Learning to listen, listening to learn (Oxford University Press, 2025). He has given presentations at the Wellcome Collection and Royal Institution, run a Live Science residency at the Science Museum, delivered the IEE Faraday Lecture, and collaborated with the London Sinfonietta to produce a free iOS app for developing rhythm skills described by the New York Times as "maddeningly addictive". He was educated in Experimental Psychology at the University of Oxford and Artificial Intelligence at the University of Edinburgh.

Workshops

Workshop 1: Music for Sleep in Hospitals

Wednesday May 6, 15:30-17:00.

Helle Nystrup Lund, PhD, Music therapist, Aalborg University Hospital, Denmark
Line Malmskov, MA, Music therapist, Bispebjerg Hospital, Denmark

Background and Aims
Music listening is known to help soothe and promote better sleep. Music intervention offers adjunctive treatment for insomnia across populations, though its effectiveness varies across individuals. This workshop aims to highlight the use of music for sleep in hospitals considering clinical populations of stroke patients, and patients with depression-related insomnia focusing on populations in psychiatry and neurorehabilitation. Stroke patients often have difficulties sleeping due to several factors such as disturbed sleep architeture and endogenios circadian rhythm, delirium and concerns about their situation. Insomnia is a well-known symptom in depression patients, which is difficult to resolve and prolongs recovery from depression. Music listening serves as a non-pharmacological treatment to support healthy sleep patterns improving general functioning and well-being.

Methods
Malmskov and Lund present clinical examples of music interventions to improve sleep from psychiatry at Aalborg University Hospital and from neurologic rehabilitation at Bispebjerg Hospital in Denmark. Malmskov presents a model based on cross disciplinary collaboration as the music therapist instructs healthcare professionals in selecting music with/for individual patients in a hospital ward. Lund presents a short-term 'music and sleep' group. Health professionals refer patients to the group as part of depression treatment in a psychiatric outpatient unit showing an example of how research findings are translated into clinical practice. Research findings are summarized. The workshop includes music listening exercises as well as exercises highlighting music selection challenges when selecting music for patients unable to inform/guide the choices of music.

Discussion
Music intervention offers adjunctive insomnia treatment facilitated by music therapists in neurorehabilitation and depression. Music intervention in hospitals is an arising field with potential and challenges. The discussion aims to open a cross-disciplinary dialogue considering music selection, personalized playlists versus expert selected music, technical challenges and other barriers, such as side effects from pharmacotherapy and motivation issues. In addition, the role of the music therapist is discussed.

Workshop 2: SLUMBER: A Framework for Home-Based Sleep Experiments Offering Dynamic Delivery of Auditory Stimuli

Thursday May 7, 15:30-17:00.

Tinke van Buijtene, Music Technology Group (MTG), Universitat Pompeu Fabra, Barcelona, Spain
Ali Saberi, Donders Institute for Brain, Cognition and Behaviour; Radboud University Medical Center, Nijmegen, The Netherlands.
Samuel Morgan, Institute for Parallel and Distributed Systems (IPVS), University of Stuttgart, Stuttgart, Germany

SLUMBER is intended to be accessible to all researchers, meaning only familiarity with basic Python syntax is required. A laptop will be needed to take part in the hands-on components of the workshop.

Abstract:
During sleep, the brain remains sensitive to auditory stimuli, allowing sound and music to influence sleep physiology, cognitive processes, and dream experiences [1, 2]. While laboratory polysomnography provides high experimental control for studying these interactions, it requires overnight supervision from the researcher, and the artificial nature of the sleep lab may influence sleep behaviour. Recent advancements in wearable technology have made high-quality sleep measurement feasible within the home environment [3], providing compact devices that participants can self-apply without direct researcher assistance. What remains missing is the infrastructure required to design, deploy, and manage home-based sleep experiments.

SLUMBER (Sleep Logging and Unsupervised Monitoring through BioElectrical Recordings) is an open-source framework to facilitate home-based sleep experiments using wearable devices. The framework supports physiological signal acquisition, real-time feature extraction, and stimulus triggering, meaning auditory stimuli may be scheduled or administered dynamically, based on a participant's current or previous sleep state. To support unsupervised data collection, *SLUMBER* also provides interactive, participant-guided procedures including automated delivery of instructions, device calibration, and behavioural tasks or surveys. Its modular and flexible design allows researchers to configure existing functionality and tailor the system to different study protocols and experimental paradigms.

This workshop will provide an overview of the framework, followed by a series of case studies demonstrating different ways *SLUMBER* has already been adapted to current research. These include playback of musical stimuli during sleep based on previously-expressed preferences, automated lucid dream induction with auditory cueing, real-time sound modulation driven by EEG activity, and even artistic applications such as the *Somnosphere* installation (also present at ConfMusSleep). Participants will then engage directly with the framework through live demonstrations and hands-on examples, in which they are able to design a basic study using *SLUMBER*. These examples and guided discussions illustrate diverse applications of the framework, and inspire attendees to design their own home-based sleep experiments. By the end of the session, participants will gain practical insights and a deeper understanding of how *SLUMBER* supports flexible and ecologically valid research.

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Talk Session 1- Music as a sleep aid

Chair: Miriam Akkermann

May 6, 11.45 - 13.00

Impacts of guided audio interventions on sleep quality: A distributed longitudinal pilot study

Jason Doescher[1], Justin Hayes[1], Patrick Tyler[2], Will Curley[1], Julia Doss[1], Timothy Victor[1], Ethan Berge[1], Destiny Berisha[1], Rob Mele[1], Blair Kaneshiro[1]

[1]soundBrilliance, LLC, Minneapolis, United States. [2]Boys Town, Boys Town, United States

soundBrilliance (https://www.soundbrilliance.com/) is a private innovation lab and digital health company founded in 2022. We develop non-pharmacological tools leveraging acoustically enhanced commercial music, vocal guidance, and natural visual imagery to empower self-management of health and wellness. We present a multi-week, at-home pilot study aimed at assessing a guided audio protocol experienced during the leadup to sleep.

This study was IRB approved, and all participants provided written informed consent prior to enrollment. Eligible participants were adults living in the United States, with normal hearing and no history of tinnitus, heart problems, fainting, seizures, or vertigo. We recruited N=21 participants aged 19–56 years (mean 39 years, 14 female, none reporting sleep apnea).

Participants were asked to complete 3–5 sessions per week in a randomized crossover protocol comprising 2–4 weeks of baseline (sleep routine as usual) followed by 4 weeks of treatment. As treatment, participants listened to 10 minutes of guided relaxation followed by 20 minutes of commercial music with binaural/monaural-beat enhancements, and finally 120 minutes of soundscapes—such as rainfall or ocean waves—as they transitioned to sleep each night.

To support ecological validity, we evaluated commercially available equipment and selected Anker sleep earbuds and House of Marley Bluetooth speakers for sound delivery and Withings sleep mats for physiological data collection. Participants accessed study materials via webapp or text-message survey prompt. Participants completed intake and exit surveys plus daily surveys on the previous night's sleep. Physiological responses (heart and respiratory rate; sleep metrics including total sleep time, percent deep sleep, sleep latency) were recorded nightly from bed entry through to waking. Across all participants we registered 596 sessions (346 baseline, 250 treatment).

Exploratory analyses suggest that sleep quality was not worsened by the intervention. While under-powered for statistical significance, we see promising directionality in the data—including some evidence of positive intervention effects, particularly for participants with moderate to high trait anxiety or lower sleep quality during baseline sessions. Interviews revealed greater self-awareness and improvements around sleep habits, but also possible discomfort from earbuds and complications around equipment use and the digital experience.

We note design tradeoffs between experimental control and ecological validity, plus operational challenges around setup, compliance, and data capture. While trait anxiety and baseline sleep quality results are promising, participants were not specifically recruited for these factors. Future studies could stratify or narrow the sample to better assess intervention effects on specific clinical subgroups.

Measuring objective and subjective sleep quality in informal dementia caregivers with bedtime music: A feasibility reversal case series

Leonardo Muller-Rodriguez

Cambridge Institute for Music Therapy Research, Cambridge, United Kingdom

Background & Aims. Informal dementia caregivers experience chronic sleep disturbance due to nighttime care demands, elevated stress and sustained hypervigilance. Sleep loss contributes to emotional dysregulation, cognitive impairment and metabolic imbalance. Despite growing evidence for the benefits of music on sleep quality, no studies have integrated subjective, physiological and circadian–biological sleep metrics in caregivers or in naturalistic home settings. This study presents a protocol combining personalised bedtime music with multimodal mixed-methods sleep assessment in home-dwelling dementia caregivers. We aimed to: (1) evaluate the feasibility of the protocol; (2) observe changes in subjective and physiological sleep-quality patterns including targeted DNA methylation; and (3) explore systematic personalisation of sleep music.

Methods. We implemented a one-arm reversal case-series feasibility design with a pre-intervention week, two personalised music-intervention weeks and a post-intervention week. Measures included: overnight actigraphy and heart-rate (sleeptiming, duration, fragmentation); EEG sleep-stage activity (SOL, efficiency, REM/non-REM proportions); validated questionnaires (PSQI, ESS, KSS, MFI, BQ, NBQ for napping behaviour); saliva sampling at bedtime and morning for circadian and sleep-relevant epigenetic markers (ADORA2A, BDNF, BMAL1, PER2, MTNR1A), assessing feasibility of detecting molecular correlates of sleep regulation and recovery following personalised bedtime music. Music playlists werecreated using the X-System combined with participant preference,emotional–cognitive associations, participant feedback and spectral featuressuitable for sleep onset. Caregivers listened while falling asleep via providediPads (n=7/8) or headphones/earphones (n=2/8; one participant alternated acrossnights).

Preliminary Results. As of December, analysis is ongoing and will be completed by the time of the conference. Preliminary findings indicate 100% retention, high adherence across measures and practical recommendations for adapting the protocol to caregiving routines. Seven of eight caregivers consistently report perceived improvements in sleep quality on personalised-music nights. EEG, actigraphy, HR and questionnaire sensitivity analyses will be presented. Home-based saliva collection proved highly feasible, with near-complete sampling across planned timepoints. Ongoing targeted methylation analysis might reveal changes across baseline, intervention and post-intervention phases.

Conclusions & Implications. This study demonstrates the feasibility of investigating neuropsychobiological mechanisms of improved sleep quality using personalised bedtime music in a naturalistic home setting among an understudied, sleep-fragmented population. By integrating psychological, electrophysiological and epigenetic measures, SLEEP-ON introduces a new framework for understanding how music interacts with sleep biology under conditions of externally caused sleep disruption. Findings will inform future controlled trials and support the development of personalised, low-cost auditory sleep interventions for caregivers and other chronically sleep-deprived groups.

How can music aid sleep? A framework for understanding the psychobioiological mechanisms underlying the effect of music as a sleep aid.

Kira Vibe Jespersen

Center for Music in the Brain, Aarhus University, Aarhus, Denmark

Many people use music as a sleep aid[1,2], and clinical studies show that music interventions can improve sleep quality in various populations[3-6]. Despite the growing amount of research in this field, the mechanisms by which music may facilitate sleep remain unclear. Researchers of clinical studies have suggested a number of mechanisms as summarised by Dickson & Schubert (2019)[7]. Similarly, survey and interview studies have highlighted the experienced mechanisms, i.e. the reasons why people use music as a sleep aid[8-10].

The objective of this study is to create a general framework of the mechanisms underlying the effect of music as a sleep aid. Through a systematic literature review, we aim to identify relevant psychological, neurological, physiological and behavioural mechanisms. To identify these mechanisms, the review will focus on basic research in the fields of music and sleep neuroscience as well as clinical and behavioural studies in the field of music and sleep. The results will be synthesized in a framework including the relevant mechanisms as well as proposing an overview of the interactions between them. By summarising the psychobiological mechanisms in a common framework, we provide the fundament for systematically testing the relevance of each element for the effect of sleep music interventions. The work is currently ongoing, and we expect to be able to present the framework at the conference.

The understanding of how music impacts sleep is essential for tailoring sleep music interventions to the individual. Depending on the type of sleep problem, some mechanisms may be more relevant than others. For example, insomnia related to mental health problems may be alleviated via different mechanisms compared to sleep difficulties in hospitalised patients. Similarly, different types of music may facilitate some mechanisms more than others. Slow music with a simple structure may be optimal for facilitating a relaxation response and reduction of physiological arousal, whereas familiar music may be optimal for mood regulation. Hence, knowledge of the underlying psychophysiological mechanisms is essential for ensuring the right type of music intervention for the specific type of sleep problem.

Talk Session 2 - Home use of sleep music

Chair: Sandra Pauletto

May 7, 10.00 - 11.00

The reasons and aims for listening to music for sleep: results from an ESM study

Rory Kirk[1], William Randall[2], Suvi Saarikallio[2]

[1]University of Sheffield, Sheffield, United Kingdom. [2]University of Jyväskylä, Jyväskylä, Finland

Background: Choices and reasons for listening to music for sleep vary (Trahan et al., 2018), however little is known about the factors associated with listening activity at night. Experience sampling methodology (ESM) allows the study of behaviours in situ and has previously shown the importance of context on daily music listening (Randall & Rickard, 2017). Using this method we may shed light on situational factors involved in listening to music for sleep.

Methods: We conducted an exploratory investigation on the choices and reasons why people listen to music when going to sleep using existing data collected by MuPsych. This ESM app samples participants with questions about their mood, activity, reasons and aims for listening and records their listening choices when they play music on their phone. After five minutes of continuous listening participants are asked to report their mood again and rate the music they are listening to. Track information gathered by the app was used to search for musical features from Spotify.

Results: 340 cases of 'Going to sleep' were reported from 201 participants, aged 13-50 (M = 23.1), 102 female (33 missing demographic information). Initial mood ratings suggested that participants tended to feel positive, low in arousal, and emotional intensity was relatively high. Their main reason for listening was to relax (97 cases, 28.9%) and the most frequent listening aim was to maintain valence (52.7%), arousal (46.7%), and emotional state (49.3%) rather than increase or decrease. After five minutes of music, valence significantly increased ($W = 4114$, $p > .001$) and intensity decreased ($W = 7588$, $p = .026$). There was no significant change in arousal. The music participants listened to tended to be rated as positive, familiar, attended to and enjoyed. Compared to non-sleep episodes the music was statistically significantly more acoustic and less danceable, energetic, live, loud, and lower (more negative) in valence ($p < .05$), however effect sizes were small (rank biserial correlation < .3 [absolute values]) and the feature profiles were broadly similar.

Conclusion: The current study investigated episodes of listening to music for sleep with an ecologically valid design targeting in-situ experiences. Music was mainly used for relaxation, characterized with increased valence, varying arousal changes, and with choices for relatively energetic music similar to non-sleep episodes. The data add granular information on emotional aims and development in the context of sleep, and demonstrates the strong potential for ESM to study sleep and music listening behaviours.

The Influence of Individual Factors on the Choice of Sleep Music: Modelling Musical Features of Sleep Music from Demographics, Music Preferences and Habits, and Psychological Factors

Silvia Genovese[1], Samuel Morgan[2], Jonathan Stumber[2], Emilia Gómez[3], Dirk Pflüger[2], Kira Vibe Jespersen[1]

[1]Center for Music in the Brain, Department of Clinical Medicine, Aarhus University & Royal Academy of Music Aarhus/Aalborg, Aarhus, Denmark. [2]Scientific Computing, Institute for Parallel and Distributed Systems, University of Stuttgart, Stuttgart, Germany. [3]Joint Research Centre, European Commission, Sevilla, Spain

Music is one of the most ancient sleep aids, with lullabies sharing common features across cultures[1]. Recent studies show that music is widely used to facilitate sleep[2-8], supported by the growing accessibility of streaming services. Prior research has examined the diversity of sleep music and the musical features that characterise it[9,10]. However, little is known about which factors affect people's individual choice of sleep music.

The aim of this study is to model how individual factors and preferences shape the selection of music for sleep, with a particular focus on identifying which of these factors are the most influential in this choice.

We collected data from more than 1000 adults who listen to music at bedtime worldwide (>80 countries) through an online survey. The survey captured demographic information, music preferences and habits, motivations, and psychological factors. In addition to these measures, respondents were asked to provide examples of the music they use to aid sleep, either as collections (i.e., albums or playlists), single tracks, or both. In total, we collected more than 62,000 music tracks and used state-of-the-art music information retrieval techniques to characterise musical content and context through both data-driven and domain-driven approaches. We analysed the distribution of individual factors (IF) and musical features (MF) and used machine learning techniques to investigate the relationships between them, starting from a similarity-based analysis to assess distances between individuals in terms of both IF and MF.

Preliminary results show differences in terms of MF between the provided single tracks and collections, particularly in valence, arousal, genre, and ML-based high-level features such as instrumentalness and acousticness. Consistency analyses also indicate that some MF might be more informative than others in characterising an individual's sleep music preference. Interestingly, we found a clear relationship between participants' general and sleep-specific music preferences. Although similarity analyses have not yet shown clear results, linear correlations between IF and MF show promising trends. While the analysis is currently still in progress, the results will be presented at the conference.

This study represents a first investigation of the relationship between individual factors of people who listen to music for sleep and the features of the music they choose. This insight advances our knowledge of the use of music for sleep in the general population and facilitates a more tailored approach towards music as a sleep aid.

Talk Session 3 - Sleep music neuroscience

Chair: Björn Rasch

May 7, 11.45 - 13.00

Investigating Perceptual Transformation and Implicit Memory Formation using the Speech-to-Song illusion in NREM Sleep

Michelle George[1], Clara Hausen[2,1], Giorgia Cantisani[3], Aubrey Danjoux[1], Daniel Pressnitzer[4], Thomas Andrillon[1,5]

[1]Paris Brain Institute - ICM, Sorbonne Université, Paris, France. [2]Berlin School of Mind and Brain, Humboldt-Universität zu Berlin, Berlin, Germany. [3]Laboratoire des Systèmes Perceptifs, École normale supérieure, Paris, France. [4]Laboratoire des Systèmes Perceptifs, CNRS, École normale supérieure, Paris, France. [5]Monash Centre for Consciousness and Contemplative Studies, Faculty of Arts, Monash University, Melbourne, Australia

The speech-to-song (STS) illusion occurs when a spoken phrase, after repeated presentations, begins to sound more musical. During wakefulness, this perceptual shift reflects increased sensitivity to pitch and melodic structure and engagement of predictive processes (Hymers et al., 2015; Tierney et al., 2013). Although the illusion is well established in wake, it remains unknown whether such perceptual recategorisation can occur during altered states of vigilance and consciousness. Although sleep is a state in which top-down predictions are reduced, implicit auditory learning remains partially preserved. Prior work shows that the sleeping brain can extract local regularities (Strauss et al., 2015), track speech, and leave implicit memory traces during NREM sleep (Andrillon & Kouider, 2016; Legendre et al., 2019). Whether these capacities support STS-like transformation and is successful during sleep is unexplored.

Participants (N=29, ongoing) were equipped with a 64-electrode EEG system with additional EOG and chin EMG sensors for sleep scoring. Using a within-subject design, we tested whether repeated speech evokes STS-like shifts during wakefulness and NREM sleep. Forty-eight validated spoken phrases were divided into Wake, Nap, and NoRepeat sets (each containing 8 illusion-eliciting and 8 control items). Participants first rated musicality for all items on a 1–5 Likert scale. In the Wake phase, the Wake set was presented repeatedly (8 loops). During the Nap phase, once in stable N2, items from the Nap set were looped while EEG was monitored to avoid presentation during arousals. After the nap, participants re-rated all stimuli for musicality and completed memory and confidence judgments.

Preliminary descriptive trends reveal a small increase in perceived song-likeness for Nap items relative to controls, although illusion strength varies considerably across individuals. NoRepeat items show minimal differences between illusion and control stimuli, whereas wakeful repetition elicits the strongest transformation, with higher post-ratings for illusion items. Subject-level indices indicate substantial variability, with a subset showing clear Nap-related rating shifts to the illusion. Together, these trends tentatively support a graded pattern—Wake > Nap > NoRepeat—consistent with partial maintenance of the illusion during sleep. Further statistical analyses are ongoing. We expect modest meta-cognitive memory traces for Nap items relative to NoRepeat items, reflecting consolidation of re-exposed stimuli during NREM sleep, while Wake items should show high explicit memory performance. Finally, exploratory analyses of EEG spectral–temporal features time-locked to repetition will examine oscillatory dynamics underlying the STS shift in wakefulness and evaluate whether aspects of this transformation are preserved during NREM sleep.

The Influences of Musical Preferences on Brain Responses During Sleep

Annika Partmann, Björn Rasch

University of Fribourg, Fribourg, Switzerland

Individual preferences strongly influence emotional responses to music (Fuentes-Sanchez et al., 2022). During wakefulness, the same musical genre (e.g. heavy metal) can induce positive emotions in some listeners, while others will judge such musical stimuli as “disturbing noise” (Ackermann & Merrill, 2022). During sleep, unpleasant noise typically has disruptive effects on sleep architecture (Smith et al., 2022). However, it is still unknown to what extent individual preferences influence the effect of musical stimuli from different musical genres on sleep continuity and brain responses during sleep.

In this ongoing study we recruit healthy participants with differing preferences for metal music. Musical preference is assessed using the STOMP-R questionnaire (Rentfrow & Gosling, 2003), based on which participants are assigned to one of two groups: “Metal-Haters” (strong or moderate dislike of heavy metal) or “Metal-Non-Haters” (from a mild dislike to a strong preference for heavy metal). To date, 20 Metal-Haters and 21 Metal-Non-Haters have completed the experiment, with data collection continuing until each group reaches 25 participants. Participants spend one adaptation and one experimental night in the sleep laboratory at the University of Fribourg. During the experimental night, all participants are presented with 4000ms excerpts of popular Metal, Pop and Blues songs during non-rapid-eye-movement (NREM) sleep, while polysomnography, including EEG, EOG and EMG, is recorded.

Preliminary analyses focused on event-related potentials (ERPs) at frontal electrodes and spectral power at frontal, central, parietal and occipital sites. Peak-to-Peak amplitudes (from the initial positive to the later negative deflection) showed a descriptively larger response in Metal-Non-Haters, although this effect did not reach significance. The analysis of latencies revealed a significant genre effect for the negative peak, with metal excerpts eliciting the fastest responses (M = 757 ms) and blues the slowest (M = 909 ms). A significant Group × Genre interaction additionally indicated that Metal-Non-Haters exhibited slower negative-peak responses to pop music.

Spectral power analyses furthermore demonstrated significant group differences: Metal-Haters showed increased delta power and elevated chin EMG, while Metal-Non-Haters displayed higher alpha and beta power during musical stimulation. However, this pattern persisted in the four seconds after stimulus presentation, making it unclear at this stage whether these differences reflect music-related effects or more general group differences.

Overall, these preliminary results suggest that individual music preferences may influence brain activity during sleep. However, conclusions remain tentative until analyses are completed on the full sample.

Nap time with music! Neural synchronization to music in sleep-onset insomnia patients

Alexandre Celma-Miralles, Peter Vuust, Kira Jespersen

Aarhus University & RAMA, Aarhus, Denmark

Sleep is crucial for physical and mental well-being. However, sleep disorders are widespread in modern society, and many individuals turn to music to improve their sleep. While clinical studies have shown that music can positively affect sleep quality [1], the mechanisms by which music facilitates sleep remain unclear. Here, we investigate whether brain waves synchronized to the beat of music can aid sleep onset. We recorded 30 minutes of resting-state electroencephalography (EEG) in the lab before and after four weeks of music-listening intervention for sleep. As part of a randomized controlled trial, we recorded participants with sleep-onset insomnia (N=60): half of them resting with music chosen from a sleep music playlist, and half of them resting in silence. The beat of the music tracks was assessed with finger tapping responses and stimuli spectrograms, while the neural activity related to the beat was obtained from frequency analyses of the EEG [2]. Sleep was assessed using standard criteria, and sleep propensity was operationalized as the delta/alpha ratio calculated from power spectral density. The results showed no significant group differences regarding sleep scores, but the music-listening group showed greater sleep propensity over time compared to the control group. Frequency-tagging analyses of the EEG revealed neural synchronization to the beat of the music tracks with a stable tempo. These neural responses reflected the processing of the beat in the music-listening group because they were weaker or absent in the silent group. In fact, the neural amplitudes correlated with beat consistency measures from tapping. When we investigated the relationship between sleep propensity and the degree of neural synchronization to the beat in each song and the preceding song, we found no significant associations. Also, no differences were detected between the two EEG recording sessions. As such, our results revealed neural synchronization to naturalistic sleep music with a steady beat but found no indication that this enhanced sleep propensity. This study provides the first examination of the role of beat synchronization in naturalistic music-based interventions for people with sleep-onset insomnia. Further analyses should complement this research with physiological measures and full night sleep recordings.

Talk Session 4 - Sleep music analysis

Chair: Dirk Pflüger

May 8, 10.00 - 11.00

Sleep Music Revisited: Open-Source Audio Feature Analysis of Universal Patterns and Subgroups

Jonathan Stumber[1], Dirk Pflüger[1], Rebecca Jane Scarratt[2], Kira Vibe Jespersen[2]

[1]University of Stuttgart, IPVS, Stuttgart, Germany. [2]Aarhus University, MIB, Aarhus, Denmark

Background and Aims

Music is widely used to support sleep, yet the acoustic characteristics that differentiate "sleep music" from general music remain only partially understood. Scarratt et al. [1] identified broad and subgroup-specific features of sleep music using Spotify's proprietary black-box audio features; however, Spotify has since discontinued access, limiting reproducibility and further analysis. This study (1) replicates and extends prior findings using transparent, open-source feature extraction from actual audio tracks, (2) compares sleep music with general music derived from the Million Playlist Dataset, and (3) reassesses evidence for distinct subgroups within sleep-related music.

Methods

In a large effort, full-length audio for the sleep-music tracks from Scarratt et al. was obtained under the EU text-and-data-mining exception for scientific research. General-music tracks were sampled from popular playlists in the Million Playlist Dataset using a procedure comparable to the original study. All audio was processed with the open-source Essentia library [2] to extract a comprehensive set of MIR descriptors and machine-learning features, including arousal/valence estimates, genre predictions, mood classifiers, and spectral, rhythmic, tonal, and temporal descriptors. Group differences were evaluated with distributional analyses and simple classification models. Subgroup structure within sleep music was examined using clustering (e.g., k-means or GMMs) with systematic sensitivity analyses across different feature sets and preprocessing strategies.

Results / Expected Results

Preliminary results show consistent feature-based differences between sleep and general music. Simple classifiers achieve 70–80% accuracy, indicating robust differentiation in line with prior literature [1, 3]. In contrast and to our surprise, no clear subgroup structure emerges within sleep music: clustering solutions vary across feature sets and algorithms and do not show a stable number of groups (i.e., six or seven) as previously proposed [1]. These findings suggest that sleep-music variation appears as a continuum rather than forming clearly separated subgroups, though there are indications that two broad sub-groups may exist.

Conclusions / Perspectives

We demonstrate that transparent, reproducible feature extraction can replicate key distinctions between sleep and general music while showing the absence of a clear, robust subgroup structure in sleep-music repertoires. To better understand why listeners prefer different music for sleep, we aim to examine the link to demographic data and individual factors in future work.

Sounding a Safe Space: Exploring the Spatial Experience of Music for Sleep

Tristan O'Leary[1], Miriam Akkermann[1], Kira Vibe Jespersen[2]

[1]Freie Universität Berlin, Berlin, Germany. [2]Center for Music in the Brain, Aarhus, Denmark

Whilst there is a growing body of research on using music as a sleep aid (Jespersen et al., 2022; Zhao et al., 2024) and common audio characteristics of music used for sleep (Dickson & Schubert, 2022; Scarratt et al., 2023), the spatial dimension of musical experience in a sleep setting remains largely unexplored. However, there is evidence highlighting the importance of sleeping spaces (Caddick et al., 2017; Kang et al., 2024) and the sense of security they can provide to facilitate sleep (Bonin et al., 2023; Samson, 2021). Listening to music can, and does, shape listeners' spatial experience (Blesser & Salter, 2007) e.g., through production choices (Doyle, 2005).

Following this, we propose that spatial features of music may serve as a means for creating a desirable sense of space for sleep. To investigate this, an online survey has been designed to explore how preferred spatial experiences for sleep vary between listeners, how listeners perceive spatially manipulated music, and how these two factors interact to influence the likelihood of using music for sleep. After demographics, the survey collects participants' preferred sleep-related spatial experience on nine seven-point semantic differential pairs. Participants then listen to 12 instrumental piano extracts (~20 seconds) with four different controlled spatial productions and rate the perceived spatial quality using the same differential pairs, followed by a rating of how likely they would be to use each extract for sleep.

We predict that excerpts whose perceived spatial attributes more closely match a participant's preferred spatial profile will receive higher likelihood-of-use ratings; this will be tested with a linear mixed-effects model. We also expect that this relationship will be stronger when participants can more accurately distinguish the intended spatial characteristics of the audio, suggesting a moderating role for perceptual accuracy.

In this presentation, we will present the complete survey results, combining listeners' ideal spatial profiles with their perceptual responses to differently spatialized musical excerpts. This will allow us to demonstrate how the perceived spatial experience of music interacts with listeners' expectations in shaping an experience which feels more or less appropriate for sleep. Finally, we anticipate showing preliminary evidence that participants' multi-dimensional spatial preference profiles cluster into at least two meaningful categories, potentially reflecting broad evolutionary or anthropological sleep-space archetypes.

Talk Session 5 - Lullabies

Chair: Perfecto Herrera

May 8, 11.30-12.45

Auditory Perception, Sleep, and Yoruba Folk Lullabies: A Cultural and Sound-Analytical Study

Sunday Akande

Olabisi Onabanjo University, Ago-Iwoye, Nigeria

Lullabies represent one of the earliest and most enduring musical forms used to support sleep, combining sound, emotion, and cultural meaning. This study examines Nigerian folk lullabies as sleep-inducing sound practices, with particular emphasis on auditory perception and musical structure. The research explores how elements such as melody, rhythm, vocal timbre, repetition, and tempo in traditional Nigerian lullabies interact with human auditory processing to facilitate relaxation and sleep readiness. Using a qualitative ethnomusicological approach, data were collected through interviews, documentation of traditional lullabies, and auditory analysis of selected songs from different Nigerian ethnic groups.

The findings revealed that Nigerian folk lullabies are characterized by slow tempos, limited melodic range, repetitive phrases, and soft vocal delivery, all of which align with perceptual features known to reduce arousal and promote calmness. Beyond their auditory effects, these lullabies function as cultural tools for emotional bonding, moral instruction, and intergenerational transmission of values. The study concludes that Nigerian folk lullabies constitute an indigenous form of sleep music that integrates auditory perception with cultural practice, offering valuable insights for contemporary research on music, sleep, and culturally responsive sound-based interventions.

Lullaby formula(s) – Music-Analytical Explorations of German Lullabies from the Long 19th Century

Franziska Weigert

Universität Regensburg, Regensburg, Germany

Many assumptions have been made about the musical composition of lullabies. For example, drawing from well-known lullaby examples, it is generally suggested that 6/8 is the preferred time signature and that descending melodic lines are typical of the genre. However, if one examines a larger corpus of lullabies – in my case, the extensive repertoire of German-language lullabies from the long nineteenth century – it quickly becomes apparent that the genre is musically far more diverse than previously expected, with compositions being strongly influenced by song schools and personal style. Despite this diversity, certain trends can be identified that tie in with the expected functionality of the genre: These include composed loveliness (especially in the sound of the voice), simplicity in harmony and form, playful linguistic elements, and musical expressions of the process of falling asleep. All of this feeds into a broader discussion on how our current and historical ideas of 'typical' and 'atypical' lullabies shape our expectations of the genre.

« Lullabies of Berlin » – a mirror of cultural memory and a bridge to lullaby singing practices

Miriam Akkermann[1], Ben Rieger[2], Maurice Mengel[3], Franziska Stoff[4]

[1]Freie Universität Berlin, Berlin, Germany. [2]TU Dresden, Dresden, Germany. [3]Ethnologische Sammlungen, Humboldt Forum Berlin, Berlin, Germany. [4]Landesmusikrat Berlin, Berlin, Germany

Lullabies can be found in a variety of cultures and across many centuries. Research into them is anchored in different areas, including music psychology, sleep research, history of music as well as cultural studies. (Faber, 1990; Trehub & Trainor, 1998; Rock et al., 1999; Bottge, 2005; Aubinet, 2024; Weigert & Schiltz, 2026; Bainbridge et al., 2020). With regard to lullabies, approaches in music research are often connected to the examination of children's songs. Günther Noll notes a rise in interest which often comes along with fostering singing of lullabies; yet, the texts seem often critical for small children (Noll, 2012). Hereby, "lullabies" are not a clearly defined musical genre, but rather a collection of different pieces that are sung to help children to fall asleep better and faster. Besides, these songs contain a lot of information on the cultural context and personal associations.

Which songs are (still) sung? Where do they come from and what are they associated with? And how are they interpreted? In the project "Berlin schläft ein" ("Lullabies of Berlin"), which was conducted 02.-12.2025, the idea was to answer these questions with regard to lullabies known and sung by people currently living or staying in Berlin.
Starting point was on the one hand the observation that Berlin is home to people from more than 190 nations (Wirtschaftsatlas Berlin 2024), who all preserve and foster lullabies in their collective memory, and on the other hand the Berlin State Music Council's [LMR] aim to use lullaby singing as a key to encourage musical practices in families and care context. In the project, adults are invited to sing a precious lullaby (recording on-site or via a specific website) after filling a short online survey on their associations with music and sleep as well as information about the lullaby they sang. All data is collected anonymously. While the combination of survey data and audio recordings are archived and available for research only, the recordings are also accessible to a general public through Berlin Ethnological Museum [Humboldt Forum]. In addition, rare language speaker from on-site recording sessions were asked to participate in an additional in-depth interview, and the LMR organized workshops for lullabies singing for amateur singers and daycare centers.

In the presentation, we will show an overview of the gathered data, challenges that appeared concerning the systematization of the collected information, and examination of the recordings with regard to tempo aspects.

Poster Session 1

May 6, 14.15 - 15.00

1: Quantifying Brain-Response Latency to Sound During NREM Sleep: A Pilot for High-Precision Closed-Loop Stimulation

Tinke van Buijtene[1], Perfecto Herrera[1], Thomas Andrillon[2,3], Sergi Jordà[1]

[1]Music Technology Group, Universitat Pompeu Fabra, Barcelona, Spain. [2]Paris Brain Institute, Sorbonne Université, Inserm-CNRS, Paris, France. [3]Monash Centre for Consciousness & Contemplative Studies, Monash University, Melbourne, Australia

Even at deep sleep stages, our auditory system remains active and responsive. Sound aligned with ongoing EEG activity can enhance slow oscillations (SOs) and influence processes such as memory consolidation, forming the basis of Closed-Loop Auditory Stimulation (CLAS) [1]. CLAS relies on timing precision, as stimuli delivered at the SO up-state enhance SO-like deflections and spindles, whereas down-state stimulation can disrupt oscillatory continuity [2].

Here we present a pilot study designed to measure and validate the brain-response delay to sound during NREM sleep, a critical component for any closed-loop system, but in particular those exploring richer sound designs, including continuous or dynamically modulated stimuli. A central technical challenge is that closed-loop systems involve two bidirectional latency components: (1) the *system delay* from EEG acquisition to sound output, and (2) the *brain-response delay* from sound onset to the resulting evoked EEG response (typically a K-Complex or SO perturbation). Characterization of these delays is necessary for ensuring that stimulation occurs within the intended phase window and does not overlap with periods in which sound would drive the oscillation in an unintended direction.

In this pilot, pink-noise bursts (50 ms, 5 ms attack/decay) will be delivered in an open-loop manner during a daytime nap. Sleep will be monitored using the ZMax wearable EEG headband, and stimulation will be enabled during N2/N3 sleep. The auditory stimulation protocol consists of alternating ON/OFF blocks (~2 minutes each), an inter-stimulus interval of 8 ± 1 s, and pseudo-randomized intensity levels of 40, 50, and 60 dB, yielding a total of 180 trials. For each stimulus, the system time-stamps sound onset and attempts to detect, in real time, the corresponding K-complex (~600-800 ms post-stimulus). These onset latency estimates will be compared with offline analyses to evaluate timing precision and to characterize intra- and inter-individual differences, including expected differences between N2 and N3. Dependent measures include ERP latency, ERP amplitude, and EEG spectral-power changes following stimulation.

Findings from this methodological pilot will inform the design of an overnight CLAS experiment using more complex, EEG-based modulated sound. The pilot also evaluates the robustness of the full experimental pipeline, including wearable EEG, real-time processing, and sound delivery, and serves as a proof-of-concept for future work. More broadly, these results will support the development of richer, music-informed stimulation that requires precise synchronization with sleeping brain dynamics.

2: Personalising Sleep Music Through User-Driven Calibration

Samuel Morgan[1], Kira Vibe Jespersen[2], Dirk Pflüger[1]

[1]Scientific Computing, Institute for Parallel and Distributed Systems, University of Stuttgart, Stuttgart, Germany. [2]Center for Music in the Brain, Department of Clinical Medicine, Aarhus University & The Royal Academy of Music Aarhus/Aalborg, Aarhus, Denmark

Recent work has indicated that there is a large amount of variety within the music chosen to aid sleep [1, 2]. Furthermore, various psychological mechanisms are linked to the use of music as a sleep aid, including emotional regulation, entrainment, and familiarity/habituation [3]. This implies that there is unlikely to be a universally 'ideal' sleep-aiding music, and that the relationship between each individual and their preferred sleep music should be approached on a case-by-case basis. However, this is currently absent from many popular forms of sleep aid (e.g., curated sleep music playlists), which take a more generalised 'one-size-fits-all' approach.

This project aims to investigate individual sleep music preference by adapting the output of an existing popular sleep music app. While music has already been seen to be effective in improving subjective sleep quality [4], personalising such an aid may improve further on this baseline. This adaptation is to be based on direct feedback from the individual, with the goal of identifying a personally-optimal position within the musical feature space. Defining the dimensions of this space is a highly nontrivial task; initial analysis is therefore needed to parameterise the space effectively, limiting complexity such that it becomes feasible to navigate, while maintaining a minimal degree of effort on the part of the individual. The parameters of this space must also be chosen such that they can be related directly to the musical output (e.g., audio effects).

The adaptation design will be based on analysis of existing sleep music, involving a data-driven approach to identify the musical features which are most informative in characterising individual sleep music preference. The initial calibration is performed during wake in advance of the experiment, with direct responses provided by the user to express their preference in terms of these properties. The effectiveness of the adaptation will be evaluated through comparison with two conditions; the first presents the participant with the same calibration interface but does not condition the output, while the second presents the existing app output without any calibration whatsoever. Accompanying measurements include brief surveys and physiological data gathered via smartwatch. As this will be collected directly from users of the app, a core challenge is to adapt the experimental procedure to the constraints of an uncontrolled home-based setting. Through these results, we hope to validate a novel method of sleep music personalisation, with respect to both subjective and objective measures of sleep quality.

3: Using music to help sleep in adolescents with sleep difficulties: a co-design study

Rory Kirk[1], Adrian Moore[1], Ning Ma[1], Maan van de Werken[2], Renee Timmers[1]

[1]University of Sheffield, Sheffield, United Kingdom. [2]SleepCogni, Sheffield, United Kingdom

Background and Aims: This ongoing study aims to understand individual differences in the use of music for sleep for adolescents with sleep difficulties. A considerable amount of research has investigated the use of music as a sleep aid for insomnia and mental health problems (Jespersen et al., 2022; Zhao et al., 2024), however much of this study has focused on adult populations. In the UK, adolescents have a high prevalence of sleep disorders and mental health conditions (NHS England, 2023) and there is a significant need for solutions to help this population. Engagement and preferences for music change with age (Bonneville-Roussy et al., 2013), therefore it is important to study how younger people experience music in therapeutic settings such as for sleep.

Methods: We are conducting a mixed-methods study involving co-design workshops and an at-home sleep study to investigate how young people vary in their needs and preferences in music for sleep. Children aged 12-16 with sleep disorders are being recruited through the sleep clinic at the Sheffield Children's Hospital. Two small group workshops (up to four people) first invite participants to share, listen, and discuss music they might use to go to sleep. The second workshop involves mixing and creating music following a paradigm inspired by the EmoteControl method (Grimaud & Eerola, 2020) using Logic and StableAudio. Participants are then invited to take part in a night study consisting of weekly sessions with a researcher to iteratively adapt selections of music to listen to at home when they go to sleep over five weeks. Sleep diaries and actigraphy watches provide data on sleep behaviour. Recordings of the workshop and co-design discussions, and music selections and creations, will be analysed to compare preferences and perceptions.

Expected results: Preliminary findings from the workshops reflect previously identified themes including the importance of familiarity and creating a sense of comfort (Kirk et al., 2025). How these themes are expressed varies between individuals, with some emphasising particular instrument sounds, the presence of lyrics, or nature sounds. The forthcoming night phase will explore how these perceptions during daytime sessions develop and transfer to experiences at night.

Perspectives: The outcomes of this investigation will provide rich qualitative information on the preferences and experiences of adolescents with sleep disorders on using music to help their sleep. This will inform follow up research and support guidance on music interventions for sleep in this population.

4: Cognitive Jukebox: The Role Of Cognitive Reserve In The Efficacy Of Bedtime Music Listening For Sleep Onset Insomnia

Tomás Peixoto[1], Maria Vânia Nunes[1], Kira Jespersen[2]

[1]Faculty of Health Sciences and Nursing | Catholic University of Portugal, Lisbon, Portugal. [2]Center for Music in the Brain | Aarhus University, Aarhus, Denmark

There is increasing recognition in healthcare that individual differences shape responses to interventions (Comai et al., 2025). This study explored the impact of educational and musical background (MB), as proxies of Cognitive Reserve (CR), on the effectiveness of music as an intervention for sleep in insomnia. CR develops longitudinally through cognitively stimulating experiences, such as education and MB (Wolff et al., 2023). Higher levels of CR are linked to better responses to rehabilitation interventions in traumatic brain injury and are suggested to offer a protective buffer against cognitive decline and other challenges (Corbo et al., 2023; Oliva et al., 2024). We hypothesized that similar CR mechanisms, particularly higher levels of education and MB, could predict lower baseline symptom severity and better intervention response in adults with sleep-onset insomnia.

We analyzed data from a randomized controlled trial evaluating the effect of music on sleep in adults with sleep-onset insomnia. Participants were randomized to an intervention group (n=25) receiving sleep hygiene education and listening to 30-60 minutes of music nightly for four weeks, or a control group (n=27) receiving sleep hygiene education only. Insomnia severity measured by the Insomnia Severity Index (ISI) was the primary outcome. MB was indexed by the OMSI musician-rank item (Ollen, 2006), which classifies individuals from nonmusician to professional musician. ANCOVAs were conducted to examine predictors of post-intervention ISI, and binary logistic regressions were used for further exploratory analyses.

Results showed that education and MB were not significantly correlated with baseline ISI. Similarly, MB showed no association with post-intervention outcomes, but education emerged as a significant predictor of post-intervention ISI ($B = 0.89$, $SE = 0.39$, $p = .034$, 95% CI [0.07, 1.70]). Contrary to our hypothesis, each additional year of education was associated with a 0.89-point increase in post-intervention ISI. A post-hoc analysis showed that each additional year of education was related to a 79% increase in the odds of attributing insomnia to stress.

The unexpected negative impact of education on intervention response likely reflects the demographics of this predominantly student sample, as higher education often relates to academic stress (Chaabane et al., 2025). Our results align with recent studies suggesting that stress can moderate or negate protective effects provided by CR (Balsamo et al., 2024; Yerramalla et al., 2024). Future studies would benefit from adopting multidimensional measures, such as the Cognitive Reserve Index Questionnaire (Nucci et al., 2012) and improving management of potential covariates.

5: To Sleep or not to Sleep: Exploring the Impact of Sleep on the Memorisation of Post-Tonal Music

Laura Farré Rozada

Royal Birmingham Conservatoire, Birmingham City University, Birmingham, United Kingdom

Background
Western classical pianists are required or expected to perform from memory both during their academic studies and at the professional level. However, there is a gap in music performance, education and psychology regarding effective memorisation training methods. Consequently, performers still struggle with memorisation, leaving musicians to find their own ways for achieving this goal, which are not always effective under pressure or within tight deadlines. For all these reasons, post-tonal music is more likely to be performed from the score, since regular memorisation strategies (namely, using traditional harmony and standard patterns) are not always applicable, leading to time-consuming procedures. Existing research on musical memory mostly focused on observing practitioners' behaviours during practice, to understand how these prepare for a memorised performance of a selected repertoire. However, the resulting Performance Cue Theory that emerged from these studies does not provide a systematic memorisation method. Additionally, sleep research suggested that learning before a night's sleep contributes to better retention and performance improvement, as opposed to learning at the beginning of a waking period. This was explored for non-musical content and tonal music, suggesting that sleeping after learning can be useful for musicians.

Aims
This paper presents the findings of a study with piano students and graduates, which tested the memorisation method Conceptual Simplification. Participants memorised post-tonal excerpts using their own techniques (control group) or following instructions (experimental group). The aim was to compare both groups' average performance and how sleeping between recalls influenced the results.

Method
Participants were allocated to the groups according to a questionnaire that evaluated their background and learning styles (e.g., perfect pitch, synaesthesia, sight-reading). Then, they performed from memory all excerpts in three situations: 1) after practice and without sleep, 2) without practice and without sleep and 3) without practice and with sleep. After each recall, they were interviewed.

Results
The most successful participants were those implementing Conceptual Simplification strategies on their own (control group) or guided by the instructions (experimental group). Most participants recalled the excerpts better after sleeping.

Conclusions
Generally, participants provided more confident and accurate performances after sleeping, while less attention was needed to monitor their playing. Hence, suggesting that many motor skills were automatised overnight, conceptual memory was strengthened, and sleep reduced the practice needed for fulfilling the task. These results emphasise the effectiveness of interspersing practice with sleep, expanding it to post-tonal music.

6: Interdisciplinary Perspectives on Sleep Music - A Book Presentation

Franziska Weigert, Katelijne Schiltz

Universität Regensburg, Regensburg, Germany

The edited volume *Interdisciplinary Perspectives on Sleep Music*, curated by Franziska Weigert, M.A. and Prof. Dr. Katelijne Schiltz, emerges from an international conference dedicated to the study of sleep music. This conference took place at the University of Regensburg in Mai 2024. Bringing together scholars from multiple disciplines, the proceedings explore music depicting sleep and music intended to help people fall asleep. With an interdisciplinary focus, the volume demonstrates how different methodological approaches - from musicology and psychology to sound studies, musical theatre and film music research - can highlight shared issues across various scientific disciplines. Topics include voice quality when singing lullabies, sleep and insomnia in Baroque *tragédie lyrique* and *Gothic plays*, dream ballets in musicals, individuals' preference of white noise machines as well as means of falling asleep, and finally lullaby compositions from the 19th to 21st centuries, including Brahms' *Wiegenlied*, Holocaust lullabies, and lullabies in Disney films.

7: The Effect of Transcranial Magnetic Stimulation on Musical Pleasure, Learning and Sleep

Sofia Simonetto-Rizk[1], Yanan Lui[2], Robert Zatorre[2], Emily Coffey[1]

[1]Concordia University, Montreal, Canada. [2]McGill University, Montreal, Canada

Music provides a powerful framework for studying neuroplasticity as it engages distributed brain networks and activates the reward system, particularly the striatum, via dopamine release. This dopaminergic activity not only enhances subjective pleasure but also facilitates learning and memory by promoting synaptic plasticity. Transcranial magnetic stimulation (TMS) offers a causal approach to probe this system where excitatory stimulation of the left dorsolateral prefrontal cortex (DLPFC), functionally connected to the striatum, has been shown to increase music-evoked pleasure, while inhibitory stimulation suppresses it. We report preliminary results from a within-subject experiment (N=24; 11 male, 13 female) investigating whether TMS-induced modulation of music-evoked reward influences musical learning and its consolidation across sleep. Participants completed two counterbalanced sessions of intermittent theta burst stimulation (iTBS; excitatory) or continuous TBS (cTBS; inhibitory) over the left DLPFC. Before and after stimulation, participants rated the pleasantness of piano excerpts, and autonomic measures (electrodermal activity, heart-rate variability) were recorded. They then performed a melody-learning task, underwent immediate performance assessment, and wore a home EEG device overnight to capture sleep physiology (slow oscillations, spindle density). Performance retention was reassessed after 24 hours. Preliminary findings show that iTBS increased subjective pleasantness and physiological arousal compared to cTBS, with corresponding trends toward enhanced post-sleep retention. Exploratory analyses of sleep EEG are used to characterize relationships between stimulation conditions, sleep physiology, and overnight memory gains. These results support a causal role of reward system activation in motor skill learning and consolidation, advancing our understanding of how pleasure, neuroplasticity, and memory interact.

8: Effects of Music on Brain-State Dynamics During Sleep Initiation and Consolidation: A Simultaneous EEG–fMRI Study

Silvia Genovese[1], Torben Lund[2], Christine Ahrends[3,4,2], Xinyuan Chen[5], Diego Vidaurre[6,7,8], Peter Vuust[1], Kira Vibe Jespersen[1]

[1]Center for Music in the Brain, Department of Clinical Medicine, Aarhus University & The Royal Academy of Music Aarhus/Aalborg, Aarhus, Denmark. [2]Center of Functionally Integrative Neuroscience, Department of Clinical Medicine, Aarhus University, Aarhus, Denmark. [3]Oxford University Centre for Integrative Neuroimaging, Nuffield Department of Clinical Neurosciences, John Radcliffe Hospital, University of Oxford, Oxford, United Kingdom. [4]Linacre College, University of Oxford, Oxford, United Kingdom. [5]Radboud University Medical Centre, Donders Institute for Brain, Cognition and Behavior, Nijmegen, Netherlands. [6]Center for Functionally Integrative Neuroscience, Department of Clinical Medicine, Aarhus University, Aarhus, Denmark. [7]Centre de Recerca Matemàtica, Barcelona, Spain. [8]Department of Psychiatry, University of Oxford, Oxford, United Kingdom

Sleep represents a fundamental process in human health and wellbeing. Nevertheless, sleep disorders are very common, with one third of adults experiencing insomnia symptoms at least once in their lives[1]. Among strategies to fall asleep, music is commonly reported as a sleep aid[2-7].

Several studies have examined the effect of music on sleep quality using both objective and subjective measures[8-15]. While music shows a positive effect on subjective sleep quality, objective findings remain mixed and inconsistent. Polysomnography, the gold standard for assessing sleep, involves averaging of brain activity across time and space, and often corresponds poorly with subjective reports of sleep quality. As such, the neural foundation of music's impact on sleep remains unclear. To further understand the music's role in the sleep-initiation process, we collected simultaneous EEG and fMRI data from people falling asleep with and without music.

The aim of the study is to investigate the neural fundaments of the effects of music on sleep initiation and consolidation. We included ~20 healthy participants with previous MRI scanner experience. Participants were scanned at their natural bedtime with and without music with a one-week interval between the two conditions. All participants filled out questionnaires about sleep quality and music reward one week before the first scan and were asked to fill out a sleep diary every morning in the six days before each scan. In the week prior to the music condition, participants were asked to listen to music in bed at home for 30 minutes.

Data collection is complete, and analyses are currently ongoing. EEG and fMRI are pre-processed separately, and EEG data is used for standard sleep scoring. To evaluate whole brain transitioning during sleep initiation and consolidation, we will use a Hidden Markov Models approach[16]. Finally, we will combine the EEG sleep scoring and HMM analyses[17] to understand how music may affect the brain state transitioning from wakefulness to sleep. Preliminary results of this study will be presented at the conference.

Using a simultaneous EEG-fMRI paradigm could provide insight into whole-brain networks involved in music listening before sleep and help explain discrepancies between subjective and objective sleep quality. Going beyond the partial understanding offered by polysomnography alone, this study aims to advance our understanding of the neural mechanisms through which music influences sleep initiation and consolidation. Insights from this work may ultimately inform the development of tailored, non-pharmacological interventions for sleep disorders.

Poster Session 2

May 7, 14:15 – 15:00

9: Musical Syntax Processing During Sleep

Anna Wick, Björn Rasch

University of Fribourg, Fribourg, Switzerland

During sleep, low-level information processing remains active, including the analysis of basic speech elements and musical features such as rhythm and musical chords, which differ in their harmonic qualities (Makov et al., 2017; Sifuentes-Ortega et al., 2022; Wick & Rasch, 2025). A key feature of music is its structured recurrence of patterns, which can create expectations in listeners that may be fulfilled or violated (predictive coding of music; Vuust et al., 2022). While musical processing has been extensively studied during wakefulness (e.g., Cheung et al., 2019), little is known about whether and how musical syntax is processed during sleep.

To address this gap, 20 healthy young participants spent one night in a sleep laboratory, where electroencephalography was used to examine the processing of basic musical syntax. Specifically, we presented harmonic cadences consisting of three chords that either fulfilled or violated harmonic expectations. Event-related potentials (ERPs) were recorded in response to sequences ending with contextually congruent or incongruent chords based on Western music conventions.

We expect differences in ERP responses between congruent and incongruent chords, indicative of whether harmonic expectations are fulfilled or violated. Moreover, we expect condition-dependent differences in the time–frequency domain.

Overall, our findings point to the persisting activity of both sensory and higher-order cognitive aspects of music perception during sleep, including the formation of expectations as well as the perception of their fulfillment or violation. This study provides a foundation for future research into music perception during sleep, using individualized, complex musical stimuli and exploring the potential sleep-related benefits of music exposure.

10: Towards a Controllable Model of Bistable Cortical Dynamics: How Music May Facilitate the Sleep-Onset Transition

Zhenxing Hu, Jean-Julien Aucouturier

Institute FEMTO-ST, Besancon, France

Many people use music to help them fall asleep, and controlled studies show that listening to relaxing music before a nap can shorten time spent in light N1 sleep and improve subjective sleep quality. (Cordi et al., 2019). Yet we still lack a mechanistic model of how such external stimuli can control the neural dynamics of the sleep-onset period (SOP). Recent work has characterized falling asleep as a dynamical transition, where EEG activity passes a tipping point consistent with a bifurcation in an underlying system. (Li et al., 2025). Building on this perspective, our current work models SOP EEG without external stimulation by embedding high-dimensional spectrograms into a low-dimensional manifold and describing the resulting trajectory as a stochastic particle evolving in a slowly changing bistable potential. This non-controlled model, fitted to single-channel recordings, captures individual trajectories from wake-like to sleep-like activity and yields parameters—such as sleep-drive slope, transition timing and intrinsic noise level—that are informative about subjective sleepiness and sleep-onset difficulties (Hu et al., 2025). In this contribution, we present this stochastic framework as a first step towards a *controllable* model of SOP dynamics for music and sleep: conceptually, musical stimulation is treated as an external input that may reshape the potential landscape or modulate effective noise, thereby altering the probability and timing of the transition. We outline how this approach can be applied to ongoing datasets with and without pre-sleep music to test whether music systematically shifts the inferred parameters, and we discuss this extension as work in progress towards mechanistic, and closed-loop musical interventions for sleep onset.

11: Are lullabies still sung to infants and children?

Franziska Degé[1], Franziska Weigert[2]

[1]Max Planck Institute for Empirical Aesthetics, Frankfurt, Germany. [2]University of Regensburg, Regensburg, Germany

Infants are born into a world full of music. It is common across cultures to interact with infants musically. Parents sing to their infants or move them rhythmically during daily routines (for reviews, see Trehub & Cirelli, 2018; Trehub & Gudmundsdottir, 2015). Caregivers around the world use singing as a way of regulating the mood and arousal of their infants. They sing lullabies to sooth and calm their offspring, whereas they sing playsongs to engage or excite the infants and gain their attention. Research of the last decades has produced interesting insights about different aspects of lullabies. However, it is unclear how common the use of lullabies to bring infants to sleep in our days is. Therefore, we conducted an online survey to investigate in what ways infants are brought to sleep and what kind of songs are sung as lullabies.

In the online survey n = 115 (94 female, 21 male) adults took part. All were caretakers of infants or children between the ages of 0 months and 10 years (*M* = 39.63 months, *SD* = 31.14 months). The online survey consisted of questions regarding bedtime rituals, child characteristics (e.g., temperament), musical sophistication as well as personality of the caretakers, and questions regarding lullabies (e.g. oral tradition, genre knowledge).

Preliminary results show that 63.5% of the caretakers report to use lullabies as a sleeping ritual for their infants and children. 36.5% report not to do so. Although quite a substantial number of caretakers use lullabies as a ritual it is not the majority of infants that fall asleep during the singing of lullabies. Only 13.9% are reported to fall asleep while singing and 13.9% fall asleep while listening to sleep music. The rest of the infants and children get to sleep while listening to audiobooks (8.7%), cuddling (8.7%), carrying around (4.7%), reading (3.5%), going for a walk 1.7% or enjoying sleep light (7.8%). For 14.8% of the infants and children the caretakers report they fall asleep without any assistance. The rest of the infants and children used things not reported on our list.

In conclusion, the preliminary analysis demonstrates that lullabies are quite common as a bedtime ritual, although it is not the ritual most children fall asleep with. In the next steps we will analyze what is sung to the children and if child or caretaker characteristics might be related to the choice of bedtime ritual or choice of song.

12: Investigating the Impact of Sound on Nap Quality and Efficiency

Abhishek Choubey[1], Thomas Andrillon[2], Miriam Akkermann[3], Sandra Pauletto[1]

[1]KTH Royal Institute of Technology, Stockholm, Sweden. [2]ICM Institute for Brain and Spinal Cord, Paris, France. [3]Freie Universität Berlin, Berlin, Germany

Sleep is essential for health and well-being (Buysse, 2014), yet many individuals struggle to achieve adequate sleep due to various factors like external disruptions, sleep disorders, and mental or physical health issues (Medic et al., 2017). Daytime naps can serve as a practical solution to counteract the effects of sleep deprivation, offering benefits such as improved mood, energy, and cognitive function (Milner & Côté, 2009). Therefore, optimizing these short naps by reducing sleep onset latency and enhancing nap quality is important. Music has emerged as a non-pharmacological intervention that can enhance sleep (Harmat et al., 2008), but there is limited research on the comparative efficacy of other types of sounds (for example, nature sounds) in improving sleep quality in naps (Capezuti et al., 2022).

This study builds on previous research that identified preferred sounds for falling asleep through an online survey. It aims to assess whether these preferred sounds can enhance sleep onset and nap quality, specifically by comparing the effects of nature sounds and musical sounds. Fifteen healthy participants between age 18 and 35 will be recruited for the study. Each participant will first complete sleep-related questionnaires, including the Pittsburgh Sleep Quality Index (PSQI) for baseline sleep quality, the Karolinska Sleepiness Scale (KSS) to measure momentary sleepiness, and the full Goldsmiths Musical Sophistication Index (Gold-MSI) to capture individual musical sophistication, along with demographic information. They will then complete a 10-minute Psychomotor Vigilance Test (PVT) to evaluate baseline vigilance. Participants will be fitted with a portable EEG system (Mentalab Experience Explore Pro) for objective sleep measurement. After a brief preparation period, the naps will last for 90 minutes. After each nap, participants will complete the KSS again and a post-nap PVT. Each participant will complete three nap sessions under different auditory conditions: nature sounds (rain), musical sounds (singing bowls), and silence.

The study hypothesizes that listening to sounds will lead to improved nap quality and sleep onset compared to the control condition. Additionally, it hypothesizes that nature sounds (rain) will enhance sleep quality more than musical sounds (singing bowls). By investigating the relationship between auditory stimuli and nap efficiency, this research aims to provide insights into how sound preferences can optimize short naps, contributing to the development of sound-based interventions for sleep improvement. These findings may have practical applications in everyday settings, supporting sleep and recovery through personalized auditory interventions. Preliminary results from the study will be presented at the conference.

13: Event-Triggered Acoustic Modulation of Sleep Bruxism

Özge Çekirge

Tarsus University, Mersin, Turkey

Background and Aims

Sleep bruxism is a sleep related movement disorder involving rhythmic masticatory muscle activity during NREM2, often accompanied by autonomic and arousal related activity. Surface electromyography (EMG) provides the most reliable high resolution method for detecting bruxism bursts and quantifying burst dynamics [1]. Previous work has shown that relaxing or slow tempo music can influence autonomic state [2] and reduce masseter EMG activity during awake bruxism [3], whereas sleep based music interventions have typically relied on continuous or pre-sleep stimulation and have seldom incorporated objective physiological measures [4]. Because acoustic cues can be delivered at very low intensities and have physiologically meaningful autonomic effects, they represent a promising modality for sleep compatible intervention.

Building on this context, we hypothesize that delivering an acoustic cue precisely at the onset of a bruxism burst may modulate arousal related dynamics and reduce burst duration or amplitude. This event-triggered stabilization concept is motivated by evidence that carefully timed nocturnal auditory cues can influence sleep processes when presented at sufficiently low intensities.

Methods

This exploratory pilot study will recruit 10 adults with clinically diagnosed sleep bruxism, each recorded across two consecutive nights. During the baseline night, masseter EMG will be continuously monitored in silence to characterize individual bruxism patterns. During the event-triggered acoustic night, EMG signals will be processed in real time using a closed-loop detection system. Signals will undergo band-pass filtering, rectification, and smoothing, and a custom burst onset algorithm with adaptive amplitude and slope thresholds will detect tonic and phasic bursts with expected latencies below 100 ms.

Upon detection, a brief relaxing acoustic cue, designed with very low intensity, smooth onset, low tempo, and low frequency dominant spectral features, will be presented to minimize risk of sleep disturbance. Analyses will compare burst duration, peak amplitude, inter-burst intervals, and early- versus late-night dynamics across nights. Additional exploratory analyses will examine short post-stimulation windows (5–15 s) to assess immediate modulation effects and identify acoustic characteristics associated with stronger attenuation.

Expected Results

Event-triggered acoustic cues are expected to reduce burst duration or amplitude and increase inter-burst intervals relative to baseline, particularly during early-night NREM periods. Acoustic profiles with greater stabilizing potential may be identified.

Conclusions

This study introduces the first closed-loop, event-triggered acoustic intervention for sleep bruxism. If effective, this physiological and data-driven approach may support the development of personalized, non-pharmacological acoustic modulation strategies and guide future adaptive or EEG-integrated systems.

14: Effects of Adaptive Generative Soundscapes During Sleep Preparation on Sleep-Related Outcomes

Bagmish Sabhapondit[1,2], Martin Dresler[3], Oleg Stavitskii[2], Miriam Akkermann[1]

[1]Freie Universität Berlin, Berlin, Germany. [2]Endel Sound GmbH, Berlin, Germany. [3]Donders Center for Medical Neuroscience, Radboud University Medical Center, Nijmegen, Netherlands

Pre-sleep hyperarousal is a well-known barrier to sleep onset, interfering with physiological processes such as heart-rate deceleration and thermoregulation (Wuyts et al.,2012). Research on music and arousal suggests that temporal change is an important driver of autonomic regulation: gradual tempo reductions increase parasympathetic activity more effectively than static slow tempi (Bretherton et al., 2019). Spectral features, including entropy and flux, further predict subjective arousal (Gingras et al., 2014), and spectral complexity has been shown to entrain cortical rhythms (Wollman et al.,2020). Although music is gaining popularity as a non-pharmacological sleep aid, the scientific study of specific musical features is hindered by the lack of structural control over real-world music.

Building on these findings, we established a protocol to test whether soundscapes that simulate a transition from an active to a calm state by a gradual temporal change in a musical feature (referred to here as adaptive soundscapes) can guide listeners toward sleep more effectively than static soundscapes during sleep preparation. To test this, we use generative soundscapes (algorithmic compositions that evolve continuously based on initial rules) that afford within-music manipulation while preserving complexity.

The study will be conducted as a 12-night within-subjects home study, in which participants experience four conditions in a pseudorandomized way: High Adaptive, Moderate Adaptive, Fixed, and Silence, during the sleep preparation phase of approximately 60 minutes. The adaptive soundscapes differ in the initial level of a musical feature (eg., spectral entropy). Sleep outcomes and pre-sleep arousal will be measured using actigraphy, wearable sleep EEG (Zmax), HR/HRV monitoring, and daily questionnaires. Additionally, the effect of subjective appraisal of the music will be assessed.

Drawing on active inference accounts of arousal (e.g., Biddell et al., 2024), we assume that soundscapes aligned with pre-sleep arousal will be assigned greater precision (or expected reliability), increasing their efficacy in further downregulating arousal and improving sleep. Therefore, we hypothesise that participants with higher pre-sleep arousal will show stronger physiological downregulation and more rapid transition toward sleep in the High Adaptive condition, while for those with lower arousal, the Moderate Adaptive soundscape is expected to outperform the Fixed soundscape, showing the efficacy of a downward trajectory even for relaxed participants.

The study design and preliminary findings will be presented, highlighting whether temporal change within music can support arousal regulation and improve sleep-related outcomes, and how generative soundscapes provide control over musical features, enabling a more rigorous study of music's physiological effects.

15: Auditory neural entrainment and states of consciousness: studies with binaural beats

Joana Sayal[1], Óscar F. Gonçalves[2], Boris Kleber[3], Alexandre Celma-Miralles[3]

[1]Center for Research in Neuropsychology and Cognitive and Behavioral Intervention, Faculty of Psychology and Educational Sciences, University of Coimbra, Coimbra, Portugal. [2]Brainloop Laboratory, CINTESIS@RISE, CINTESIS.UPT, Universidade Portucalense Infante D. Henrique, Porto, Portugal. [3]Center for Music in the Brain, Dept. of Clinical Medicine, Aarhus University & RAMA Aarhus, Denmark

Consciousness involves the flow of neuronal information strongly linked to oscillatory synchronization in the brain. The alignment between environmental rhythms and brain oscillations is known as neural entrainment, and it might play a role in states of consciousness. When it occurs in response to auditory stimuli, it is termed auditory neural entrainment - brain waves syncing with sound waves.
Building on previous research about the effects of music on people with disorders of consciousness, our study aimed to characterize and modulate states of consciousness (focused attention and mind wandering) through matching and mismatching of auditory neural entrainment.
We investigated auditory synchronization with sounds matched in frequency with the typical brain waves measured with EEG (delta, theta, alpha, beta, gamma). Preliminary analyses revealed no EEG entrainment to binaural beats in 5 frequencies (3Hz, 6Hz, 10Hz, 18Hz and 30Hz). In the current study, we tested a more robust paradigm adding monaural beats and metronome beats, and a task to measure behavioural effects of sound stimulation on states of consciousness, from focused attention to mind wandering.
We hypothesise that slower beats increase mind wandering and low frequency brain waves, and faster beats increase focused attention and high frequency brain waves. Current results are presented.
Understanding neural synchronization with auditory stimulation in diverse states of consciousness holds potential for future research focused on improving the rehabilitation of disorders of consciousness, as well as deepening our knowledge about the effects of sound on the brain.

16: Personalizing sleep music: The relationship between listening habits and sleep music expectations

Julietta Tauber[1], Josephine Dunselman[2], Miriam Akkerman[3]

[1]Dresden University of Technology, Dresden, Germany. [2]Radboud University, Nijmegen, Netherlands. [3]Freie Universität Berlin, Berlin, Germany

Sleep music typically encases soft, slow and instrumental music (Scarratt et al., 2023) and is seen to be consistent across cultures (Trehub et al., 1993). However, familiar non-typical music is also seen to improve relaxation (Scarratt et al., 2025). Furthermore, literature does not show what musical features people expect in sleep music, and how these expectations relate to actual choices of sleep music. Young adults (16-21), an often underrepresented cohort, are especially interesting, as musical taste is mainly formed during early adulthood, shaping identity and grounding future preferences (Lamont & Hargreaves, 2019).

The aim of this study is to examine how young adults envision sleep music, how expectations towards sleep music are connected to the sleep music they choose, and if there are differences between people who listen to sleep music often versus those who use it rarely.

A survey (*n*=99, 77% age 16-21) was conducted at two German high schools, collecting data on sleep music features (e.g. slowness, quietness), the music listened to during the day and before sleep, and the frequency of sleep music usage.

We hypothesize that people who listen to sleep music frequently will choose music that deviates more from envisioned sleep music features than the music people choose who are only occasional sleep music listeners. To analyse the data, the reported music was first categorised into genres; the genre best representing the expectations towards sleep music will be chosen as a baseline. A similarity comparison between this baseline and the chosen sleep music will create the dependent variable, resulting in an expectation-choice similarity score. Participants will be grouped based on their use of sleep music. Mean scores for these groups will be compared using an independent-samples t-test. Support for the hypothesis would indicate that frequent listeners rely more on familiarity and habituation when choosing sleep music than occasional listeners.

We further expect that the more people listen to sleep music, the more the chosen sleep music will resemble the music listened to during the day. This hypothesis will be tested through qualitative analysis. If a resemblance is found, this will further substantiate the idea that listeners rely more on familiarity than learned expectation when choosing sleep music.

On the poster, data description and clean-up processes will be presented. We will highlight the listening behaviour of frequent and occasional sleep music listeners and discuss the implications for personalising sleep-music interventions, emphasising the need for individualised approaches.