SEMPRE Graduate Conference 2019

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Conference Programme

		chairs	speaker	08:30
	Registration and setup			
	Keynote	*Ian Cross*	Martin Rohrmeier	10:00
	Coffee			11:15
Flash Talks	**Flash talks**	*Rebecca Whiteman*	Marianna Cortesi	11:30
			Elisa Gillner	
			Pedro Douglas-Kirk	
			Anna Detari	
			Federico Pendenza	
			Daniel Harasim	
			Melissa Kirby	
	Lunch and Posters			12:30
Longer Talks	**Longer talks**	*Alex Lamont*	Lindsay Warrenburg **Hickman award**	14:00
			Landon Peck	14:15
			Katie Rose Sanfilippo	14:30
			Sarah Hashim	14:45
			Scott Bannister	15:00
			Peter Harrison	15:15
	Tea			15:30
Flash Talks	**Flash talks**	*Satinder Gill*	Merve Akca	15:45
			David Baker	
			Efren De la Mora	
			Omer Leshem	
			Rémi De Fleurian	
			Diana Kayser	
			Ugne Peistaraite	
	Plenary session	*Ian Cross*		16:45
	End of conference			17:00

ABSTRACTS

KEYNOTE TALK

Prof. Martin Rohrmeier
Director, Digital and Cognitive Musicology Lab
École Polytechnique Fédérale de Lausanne

Exploring tonality: bridging music theory, cognition and computation

Music constitutes a central aspect of human nature and is a cross-cultural universal. In recent years, music research has attracted wide interest across the cognitive sciences ranging from linguistics, psychology, neuroscience, computer science, or mathematical modeling, up to anthropology and evolution. As a complex and multi-faceted stimulus, music provides a rich window into the human mind. This talk will explore the notion of tonality and the underlying principles of musical structure building. Being closely tied to its temporal unfolding, these are fundamental for our understanding and enjoyment of music: they become audible, for instance, when music elicits a sense of looming finality, or when listeners experience the flow of tension and release, or, are struck by musical surprise. I will characterise the link between musical structure, its perception and aesthetics, and compare empirical predictions with evidence from psychological research, corpus studies as well as computational models. Finally, I will reflect on the potential and the challenges of music research at the intersection of different disciplines.

FLASH TALKS SESSION 1

Marianna Cortesi
University of York

The impact of competition on musicians' mental health: A comparison with sport, effective coping strategies and educational responsibilities

A sample of musicians with different experiences recently interviewed in the UK reported to feel a sense of uncertainty and pressure specifically linked to their job (Gross & Musgrave, 2017). In particular, they regarded the perception of working in a highly competitive environment as a relevant source of stress. In recent years there has been an increase in the amount of research focusing on musicians' mental health, particularly in relation to music performance anxiety, but there is scope for further research investigating factors such as competition that can contribute to poor mental health.

The purpose of the current research is to explore and investigate the negative aspects of competition in music, its effects on musicians' physical and mental wellbeing, and coping strategies that can be employed to counter negative effects.

The scarcity of research focusing on the relationship between competition and mental health in music suggests that lessons could be learned from other fields to fill in the gaps in music literature (Hays, 2002; Whitmore, 2009). For instance, while competition is an irreplaceable characteristic of sport, musicians are also often involved in competitive environments. Consequently, coping strategies employed by sports people and athletes may be relevant for musicians who face competitive situations that affect their mental health.

As competition is experienced not only by professional musicians but also by young musicians it is also a responsibility of educational providers who work with music students to train them toward these kind of situations. Current research indicates that during their training music students are not adequately supported and prepared to face these situations (Williamon & Thompson, 2006). However, as there are multiple educators whose duty is to convey appropriate methods and coping strategies to students, more research might be done on the role of teachers, parents, educational institutions as well as friends and fellow musicians.

References

Gross, S. A., & Musgrave, G. (2017). *Can music make you sick? A study into the incidence of musicians' mental health*. University of Westminster, London, UK. Retrieved from http://www.musictank.co.uk/wp-ontent/uploads/woocommerce_uploads/2017/10/Can- Music-Make-You-Sick-Part-2-Qualitative-Study.pdf

Hays, K. F. (2002). The enhancement of performance excellence among performing artists. *Journal of Applied Sport Psychology*, 14(4), 299-312.

Whitmore, J. (2006). *Coaching for performance. Growing human potential and purpose* (4th ed.). USA: Nicholas Brealey.

Williamon, A., & Thompson, S. (2006). Awareness and incidence of health problems among conservatoire students. *Music and Psychology Research*, 34(4), 411-430.

Elisa Gillner
Humboldt University, Berlin

Exploring the potential for positive expectation to enhance the relaxing effects of music

Stress-related diseases pose a major threat to the public health of the Western population. To relax, many people listen to music. Research has shown that music can reduce stress and have a positive effect on health more generally (e.g., MacDonald, 2013; Pelletier, 2004). Moreover, research into the influence of expectation and explicit information has shown that both do not only influence our perception, behaviour, and evaluation but may also be harnessed to improve health (e.g., Duerksen, 1972; Janzen et al., 2006; Kroger & Margulis, 2017). Interested to explore the potential for this further, I set out to investigate whether adding positive expectation about the relaxing effects of a piece of music would affect the degree of relaxation experienced by participants and further enhance the music's effect. As far as I am aware, there has been no other research to date that sheds light on this question.

In an experiment, 20 participants were asked to listen to the same piece of music twice, each time after being exposed to stress induction. To test the impact of delivered expectations, participants were told that the two pieces of relaxing music were basically the same, but the frequency range was edited in one of the pieces in such a way that the edited music would stimulate the theta-brainwaves and thus the participant would feel more relaxed. Methods of measurement and data collection included a demographic questionnaire, Tension Rating Scale, Music Rating Scale, State-Trait Anxiety Inventory, and physiological assessment of heart rate. The socially evaluated cold-pressor test (Schwabe, Haddad, & Schachinger, 2008) was used as a laboratory stressor.

First results show that 13 of 20 participants experienced higher levels of relaxation after listening to the ostensibly edited piece of relaxing music. I shall be discussing these and subsequent results in the current context of music and health.

References

Duerksen, G. L. (1972). Some Effects of Expectation on Evaluation of Recorded Musical Performance. *Journal of Research in Music Education*, 20, 268–272.

Janzen, J. A., Silvius, J., Jacobs, S., Slaughter, S., Dalziel, W., & Drummond, N. (2006). What is a health expectation? Developing a pragmatic conceptual model from psychological theory. *Health Expectations: an International Journal of Public Participation in Health Care and Health Policy*, 9, 37–48.

Kroger, C., & Margulis, E. H. (2017). "But they told me it was professional": Extrinsic factors in the evaluation of musical performance. *Psychology of Music*, 45, 49–64.

MacDonald, R. A. R. (2013). Music, health, and well-being: a review. *International Journal of Qualitative Studies on Health and Well-Being*, 8, 20635.

Pelletier, C. L. (2004). The Effect of Music on Decreasing Arousal Due to Stress: A Meta-Analysis. *Journal of Music Therapy*, 41, 192–214.

Schwabe, L., Haddad, L., & Schachinger, H. (2008). Hpa axis activation by a socially evaluated cold- pressor test. *Psychoneuroendocrinology*, 33, 890–895.

Pedro Douglass-Kirk[1], Mick Grierson[2], Nick Ward[3], Fran Brander[3], Kate Kelly[3,] Will Chegwidden[3,] Dhiren Shivji[3] , Lauren Stewart[1]

[1]*Goldsmiths University of London* [2]*Institute of Creative Computing*
[3]*London National Hospital for Neurology and Neurosurgery*

Sonic Sleeve: Reducing Compensatory Movements in Stroke Rehabilitation via Auditory Feedback

Background Stroke is a leading cause of adult disability (Benjamin et al., 2018) and support for rehabilitation of the upper limb is typically inadequate. Providing real-time auditory feedback to patients about undesirable compensatory movements (e.g. trunk leaning or shoulder abduction when undertaking reaching tasks) may help patients achieve more consistent efficient movement patterns.

Rationale In prior research we established that self-selected favourite music provides a motivating context for stroke patients to undertake repetitive forward reach movements as part of their physical rehabilitation (Kirk et al., 2016). The current goal is to build on this by incorporating auditory feedback while they move to music, which will signal when the patient is using compensatory movements to achieve their target movement. In the context of stroke patients who may have perceptual and cognitive difficulties, it is essential that the feedback is as simple as possible. Thus the current study will assess the use of silence (muting the music so long as compensatory movements are occurring) as a salient yet simple prompt for patients to correct their movement and continue performing the target movement in a more optimal way.

Aims 1) To establish if patients undertaking an active forward reaching task can reduce compensatory movements with the aid of auditory feedback.

2) To determine whether training with auditory feedback will induce a carry-over effect such that reduced compensation is also seen in the absence of auditory feedback; this will be investigated at two time points: immediately after exposure and 24 hours later.

Methods Forty-five chronic stroke patients will be recruited for the pilot study. A machine learning platform Wekinator (Fiebrink, Trueman, & Cook, 2011) will be used to collect kinematic data of patients' compensatory movements from a 2D webcam using OpenPose (Cao, Simon, Wei, & Sheikh, 2017) and mapping the movement data to real-time auditory feedback. The study conditions: experimental (with feedback) and control (without feedback) will be matched to the patient's baseline movement tempo.

References

Benjamin, E. J., Virani, S. S., Callaway, C. W., Chamberlain, A. M., Chang, A. R., Cheng, S., ... Muntner, P. (2018). Heart disease and stroke statistics - 2018 update: A report from the American Heart Association. *Circulation*, 137(12), E67–E492.

Cao, Z., Simon, T., Wei, S.-E., & Sheikh, Y. (2017). Realtime Multi-Person 2D Pose Estimation Using Part Affinity Fields. Retrieved from http://openaccess.thecvf.com/content_cvpr_2017/html/ Cao_Realtime_Multi-Person_2D_CVPR_2017_paper.html

Fiebrink, R., Trueman, D., & Cook, P. R. (2011). The Wekinator: Software for using machine learning to build real-time interactive systems. Retrieved from http://research.gold.ac.uk/9427/

Kirk, P., Grierson, M., Bodak, R., Ward, N., Brander, F., Kelly, K., ... Stewart, L. (2016). Motivating Stroke Rehabilitation Through Music: A Feasibility Study Using Digital Musical Instruments in the Home. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 1781– 1785.

Anna Detari

University of York

Musician's Focal Dystonia: A mere neurological disorder?

Musician's Focal Dystonia is a movement disorder with unknown pathophysiology and no reliable treatment, which can impair the ability to play an instrument, and ended many successful careers. Neurological studies have found changes in sufferers' brains, which probably occurred via negative neuroplasticity. However, surprisingly little is known of the causes and triggers of such a change. The presence of non-organic determinants, such as problematic psychological traits, is acknowledged in recent studies but have not yet been explored in detail.

In my research, twelve musicians were interviewed in order to gain an in-depth understanding of the possible contributing factors. Apart from previously identified negative traits, such as anxiety, perfectionism, and obsessiveness, the findings included environmental factors, especially the negative influence of instrumental teachers. Many participants reported unattainable demands, negative emotional climate, and technique-focused teaching during their music studies. Furthermore, these characteristics seemed to filter through into their personal practice and accompanying behaviours longs after their studies were finished, in the form of unhealthy practice behaviours and negative perfectionism. These problems were accompanied by negative emotional coping and health behaviours in many cases. In addition, the presence of a preceding personal or professional trauma has also been found.

The findings suggest that MFD is a multifaceted condition and might be partially originated from psychological and personality traits, and environmental factors. This might have further implications not only for the current research but for the treatment strategies as well. It is likely, that opposing a purely medical procedure, an interdisciplinary approach would enhance the current therapies and would increase the possibility of the rehabilitation of the suffering musicians. Further research is needed to build a detailed biopsychosocial model of the condition and understand how non-organic factors influence the onset and the rehabilitation of the condition.

Federico Pendenza
University of York

Playing-related musculoskeletal disorders among guitar players and risk-reducing strategies

Playing a musical instrument requires intense use of the human body. Musicians spend several hours rehearsing the highly skilled movements necessary to achieve a desired musical output. Therefore, their bodies undergo a great amount of physical and mental stress which might result in the development of playing-related problems (PRPs). These disorders include injuries to the musculoskeletal system - bones, tendons, joints and nerves - along with hearing problems and music performance anxiety issues.

The purpose of this paper is to analyse the incidence of playing-related musculoskeletal disorders (PRMDs) among professional and amateur guitarists highlighting the limitations of the current state of research; the choice to focus on professional and amateur guitarists has been made so as to inform the vast number of guitar instructors who deal with different levels of players and who play different genres. Considering the most recent research-based studies on PRMDs among guitar players, this paper suggests that there is high incidence of musculoskeletal problems within the guitar community (Marques, Rosset-Llobet, Fonseca Marques, Gurgel, & Augusto, 2003; Rigg, Marrinan, & Thomas, 2003; Fjellman-Wiklund & Chesky, 2006). However, it is difficult to determine an accurate pain rate among guitarists due to the heterogeneity of the studies in terms of age of the participants, their level of musical training and the different definitions of pain.

Furthermore, this paper also explores the use of ergonomic guitar supports (Pozzo, Viola, DelSal, & Gaertner, 2016; Valenzuela-Gómez, Rey Galindo, & Aceves-González, 2018) and body awareness techniques such as the Alexander Technique and the Feldenkrais Method to promote health prevention, limit the occurrence of health problems and foster the underlying idea of a music pedagogy which not only considers the musical outcome, but also the health and well-being of musicians.

References

Fjellman-Wiklund, A., & Chesky, K. (2006). Musculoskeletal and general health problems of acoustic guitar, electric guitar, electric bass, and banjo players. *Medical Problems of Performing Artists*, 21(4), 169-176.

Marques, D. N., Rosset-Llobet, J., Fonseca, M. F., Gurgel, I. G. D., & Augusto, L. G. S. (2003). Flamenco guitar as a risk factor for overuse syndrome. *Medical Problems of Performing Artists*, 8, 11-14.

Pozzo, R., Viola, S., DelSal, A., & Gaertner, H. (2016). Force distribution and EMG parameters in classic-guitar players using different sitting behavior. *International Journal of Psychophysiology*, 108, 27-28.

Rigg, J. L., Marrinan, R., & Thomas, M. A. (2003). Playing-related injury in guitarists playing popular music. *Medical Problems of Performing Artists*, 18(4), 150-152.

Valenzuela-Gómez, S. A., Rey-Galindo, J. A., & Aceves-González, C. (2018). Evaluation of posture, self-efficacy, comfort and discomfort in guitarists while using auxiliary implements for instrument positioning. In R. H. M. Goossens (Ed.), *Advances in Social & Occupational Ergonomics*. Retrieved from http://www.researchgate.net/publication/318155038_Evaluation_of_Posture_Self-efficacy_Comfort_and_Discomfort_in_Guitarists_While_Using_Auxiliary_Implements_for_Instrument_Positioning/references.

Daniel Harasim
École Polytechnique Fédérale de Lausanne

Unsupervised Grammar Induction of Jazz Harmony

Hierarchical models of music formalize theoretical concepts and describe perceived structures of musical events. The harmonic languages of idioms such as Cool Jazz, Beatles songs, or Mozart sonatas can for example be modeled using the framework of formal language theory. It extends sequential approaches such as hidden Markov models and multiple-viewpoint systems by nested non-local dependencies, assuming a latent hierarchical structure. Probabilistic grammars can in particular be used to automatically perform music analyses, that is to infer the latent syntactic structure of the observed music. The formalism does thereby not aim at a unique "correct" analysis of a piece, but accounts for different subjective listening experiences ranked by plausibility.

Until today, syntactic models of harmony are either hand-coded by humans or inferred from hand- coded annotations (supervised grammar induction). The present study continues the computational research on harmonic syntax by showing that the grammar rules and harmonic constituents that are most important for theoretical descriptions are also learnable just from the observation of chord sequences (unsupervised grammar induction). We applied Bayesian inference methods of abstract context-free grammars to learn harmonic grammars under several preconditions such as the existence of scale degrees, modulation, or the prevalence of right-headedness.

All models were trained and tested on harmonic sequences of Jazz standards. To evaluate the inferred models, a dataset of about 100 harmonic syntax analyses was compiled by the authors. The results show that the unsupervised models perform about as well as the supervised models, and that the amount of required training data is much less than for models of natural language syntax. Future research will focus on integrating metrical information into the harmonic models and applying them to compare the harmonic language of different musical idioms.

Melissa Kirby, Karen Burland
University of Leeds

Exploring the Functions of Music in the Lives of Young People on the Autism Spectrum

Current research investigating the functions of music in everyday life has identified cognitive (Sloboda, Lamont & Greasley, 2016; Hargreaves & North, 1999), emotional (Greasley & Lamont, 2011; Schäfer, Sedlmeier, Städtler & Huron 2013) and social functions of music (Hargreaves & North, 1999). However, previous research focuses almost exclusively on neurotypical people and rarely considers the musical experiences of autistic people. Additionally, previous research involving autistic people rarely asks people on the autism spectrum directly about their experiences, and therefore does not accurately represent the views of the autistic community. This paper aims to explore the function of music in the lives of young people on the autism spectrum, by interviewing them about their musical experiences. An adaptive interview technique and specially developed resources utilising the Picture Exchange Communication System were used to interview 11 young people on the autism spectrum age 12 – 25 (X=19.4) with a range of communicative and personal needs. Interpretative Phenomenological Analysis revealed four key functions of music in the participants' lives: Cognitive, Emotional, Social and Identity. Collectively, these results provide a unique insight into the musical experiences of young people on the autism spectrum. Additionally, the present study proposes an Alternative Conceptualisation of the Functions of Music, which goes beyond the identification of musical behaviour, and attempts to explore the outcomes of functional musical engagement. Although the findings of the present study are most relevant for music psychologists, autistic people and their families, the methodological approach of this study has implications for other contexts where hearing directly from the autistic community would be beneficial, including education, community and healthcare settings.

LONG TALKS

Hickman Award Paper
Lindsay Warrenburg
Ohio State University

Melancholy versus Grief: Has research on musical 'sadness' conflated two different affective states?

Psychological research related to human crying suggests the existence of two different yet complementary states, melancholy and grief (Vingerhoets & Cornelius, 2012). These emotions have separate motivations and physiological characteristics. When characterizing nominally "sad" music, listeners appear to offer a wide range of descriptions. Could it be that this large variance in responses is a consequence of the failure to distinguish melancholy from grief?

The current study addresses this distinction by examining listeners' perceptions of "sad" music in a series of five studies. Three judges listened to 62 passages of "sad" music and classified them as *melancholy* or *grieving*. The first experiment asked those with superior aural skills to rate structural parameters of these melancholic and grief passages (e.g., harsh timbres, narrow pitch intervals) on 7-point unipolar scales in order to examine the musical differences between these "sad" states; the results suggest that different musical parameters can be identified in melancholy and grief music (R^2 = 81.8%). The other four studies asked listeners to rate perceived emotions (Study 2; n = 49) and experienced emotions (Study 4; n = 57) from melancholic and grieving passages. Results are consistent with the hypothesis that listeners can distinguish musical grief from musical melancholy ($p < 0.05$) and that these two stimuli types give rise to different emotions ($p < 0.05$). Notably, grief music is related to feelings of crying, death/loss, and transcendence, whereas melancholy music is related to feelings of reflection, depression, and relaxation. Both the perceived and induced emotion findings were replicated using different experimental designs (Study 3; n = 57 and Study 5; n = 81)

These studies hold implications for refining the umbrella concept of "sadness" in music research. The results are consistent with the idea that musical "sadness" consists of more than one emotional state.

Landon Peck
University of Oxford

Generalisability and Bifurcation of Music Associated with Experiences of Awe

Awe is an interesting and powerful multivalenced emotion that is relatively unexplored through empirical research in music psychology. A seminal psychology paper exploring awe suggests that music meets the appraisal requirements to produce the state of awe (Keltner & Haidt, 2003). However, these experiences may vary greatly between individuals. This study investigates the music facilitating these experiences and whether it is recognisable and categorisable by a wider population as relating to states of awe. By conceptualising awe as a response to the sublime (Konenčni, 2005), we hypothesise that music related to these states of awe should be categorisable into two to domains based on valence. To test this hypothesis an online experiment was carried out (N = 80) in which participants listened to music excerpts that were previously reported to induce awe and rated the appropriateness of two images, the aroura borealis and a supercell thunderstorm. These images implicitly conveyed positive and negative valences, respectively, through their subject matter (Gordon et al., 2017). Results showed that that participants associated the music into two distinct image and valence categories, and that the overlap between associations of the two images was generally insignificant. These findings suggest that there is a recognisable subset of music involved in producing awe that can be generalisable in a way that larger populations share similar evaluations of the music. This does not describe all instances of musical awe, but it does suggest that these two valence categories constitute a broad perceptual division in experiences and our understanding of musical awe. Continuing studies are currently underway to further investigate emotional terms and additional appraisal criteria associated with this bifurcation.

References

Gordon, A. M., Stellar, J. E., Anderson, C. L., McNeil, G. D., Loew, D., & Keltner, D. (2017). The dark side of the sublime: Distinguishing a threat-based variant of awe. *Journal of Personality and Social Psychology*, 113(2), 310-328.

Keltner, D., & Haidt, J. (2003). Approaching awe, a moral, spiritual, and aesthetic emotion. *Cognition and Emotion*, 17(2), 297-314.

Konecni, V. J. (2005). The aesthetic trinity: Awe, being moved, thrills. *Bulletin of Psychology and the Arts*, 5(2) Dataset. doi:10.1037/e674862010-005

Katie Rose Sanfilippo[1], Bonnie McConnell[2], Hajara B. Huma[3,4], Malick Gaye[3,4], Buba Darboe[4], Hassoum Ceesay[3], Paul Ramchandani[5], Ian Cross[5], Victoria Cornelius[6], Vivette Glover[6], Lauren Stewart[1]

[1]*Psychology Department, Goldsmiths, University of London, UK* [2]*The Australian National University, Australia* [3]*The National Centre for Arts and Culture, The Gambia* [4]*The Ministry of Health and Social Welfare, The Gambia* [5]*University of Cambridge, UK* [6]*Imperial College London, UK*

Maternal Music in The Gambia: Understanding Music's Role in Maternal Mental Health

Background Perinatal mental health problems are a particular challenge in low and middle-income countries (LMICs) where they can be twice as frequent as in higher income countries. Music-centred approaches may be particularly useful in The Gambia since a range of musical practices that specifically engage pregnant women and new mothers already exist.

Research Questions 1) How are feelings of anxiety and depression described and what are the potential contributing factors to ill mental health? 2) Can we adapt previously developed measurement tools to work within the Gambian context? 3) How does music already play a role in maternal health and how can it be used to support antenatal well-being?

Methods We ran focus groups with a variety of stakeholders: pregnant women, community birth companions, midwives and musicians. We used the Edinburgh Postnatal Depression Scale (EPDS) and the Self Reporting Questionnaire (SRQ-20) to measure symptoms of mental distress in 100 Gambian pregnant women from 10 clinics. Local research assistants ran the focus groups and administered the scales orally.

Results Q1: The concept of an unstable mind (*Sondomoo Tenkung Baliyaa* or *Hel bu Dalut*) was identified as the most appropriate term to use when discussing ill mental health. The three main types of contributing factors were social, economic, and spiritual ones. Q2: The SRQ-20, with more items measuring somatic symptoms, is a more sensitive tool within The Gambian context. Q3: Music, and specifically group singing, may be helpful for expectant mothers as a way to learn about maternal mental health and ways to seek help, lift their mood, and connect to their baby. Existing music practices, such as infant naming ceremonies, performances by Kanyeleng groups, and lullabies give examples of how existing musical practices already support and can be adapted to support pregnant women.

Discussion This work helps build the foundation for a larger project where we are testing the feasibility of a community based group-singing intervention to reduce symptoms of anxiety and depression in pregnancy.

Sarah Hashim*, Lauren Stewart, Mats Küssner
*Durham University

Investigating the Effects of Suppressing Music-Elicited Visual Mental Imagery on Emotional Response

Numerous studies have sought to explain why music can induce emotional responses from us. The underlying mechanisms for music-elicited emotion were famously proposed by Juslin & Västfjäll (2008), citing visual mental imagery (VMI) as one, where mental images are formed without the influence of a physical external input. Very few studies have endeavoured to explain its influence, despite its prominent presence in our lives in all domains. The project here aimed to investigate the mediatory role of VMI between music listening and emotional response by suppressing the formation of VMI during music listening.

The notion of suppressing a spontaneous abstract occurrence can be difficult to grasp, therefore we looked to clinical studies which provided several suppression methods that are often used to aid the intrusive mental images that PTSD patients tend to experience. Using an eye-movement task meant to interfere with the visuospatial sketchpad of working memory (Kemps & Tiggemann, 2007), we predicted that distracting the formation of VMI during music listening would lead to a subsequent reduction in induced-emotion ratings. Twenty-two participants rated their VMI and emotion responses to short excerpts of film music whilst following a small white square flash on alternate sides of a computer screen with their eyes.

As predicted, the task effectively reduced VMI ratings, however emotion ratings did not produce a statistically significant difference despite mean ratings travelling in the expected direction mirroring the VMI results. We conclude that with the inclusion of a larger sample size, we might have achieved more pronounced emotion suppression. Nevertheless, the study provides novel insight into the role of VMI on music-induced emotions, with the hopes of catalysing similar research using other mechanisms and furthering the understanding of our own emotive relationship with music.

References

Juslin, P. N., & Västfjäll, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31(5), 559–575.

Kemps, E., & Tiggemann, M. (2007). Reducing the vividness and emotional impact of distressing autobiographical memories: The importance of modality-specific interference. *Memory*, 15(4), 412–422.

Scott Bannister

Durham University

Manipulating Experiences of Musical Chills Through Changes in Loudness and Brightness

Musical chills, an emotional experience accompanied by goosebumps, shivers and tingling, has attracted notable interest in music and emotion research. The response has been linked to musical structures such as dynamic and textural changes, or unprepared harmonies. However, until recently no study has attempted to manipulate musical stimuli to assess effects on chills experiences across listeners.

A recent first attempt at manipulating musical chills found strong positive correlations between chills and psychoacoustic features such as loudness and spectral brightness (Bannister and Eerola, 2018). Therefore, the current study aimed to manipulate chills experiences by increasing and decreasing loudness or brightness in two musical stimuli. It was predicted that increases in loudness and brightness would result in more frequent experiences of chills across listeners.

Participants (N = 40) took part in the listening experiment, and heard versions (original, high or low loudness, high or low brightness) of two unfamiliar excerpts used in a previous study (*Glósóli, Ancestral*). During listening, participants pressed a button to record any experiences of chills, releasing the button when chills had ended; skin conductance data were collected to validate button presses. After each listen, participants rated their emotional experience via self-reports. Each participant listened to five stimuli: three versions of one excerpt, and two of the other.

Results suggest that effects of loudness and brightness manipulations differed between the two pieces; for *Glósóli*, increased loudness and decreased brightness resulted in more frequent chills experiences, whereas the opposite was true for *Ancestral*. Skin conductance levels were larger during chills in high loudness and high brightness conditions, indicating stronger emotional experiences.

This study provides a novel, first attempt at manipulating musical chills through psychoacoustic features. Findings are discussed in terms of fear and vigilance theories of chills, and complex interactions between psychoacoustic features, musical structures and preceding musical progressions.

References

Bannister, S., and Eerola, T. (2018). Suppressing the chills: Effects of musical manipulation on the chills response. *Frontiers in Psychology*, 9: 2046.

Peter M. C. Harrison, Marcus T. Pearce
Queen Mary University of London

Instantaneous consonance in the perception and composition of Western music

Instantaneous consonance is a fundamental perceptual phenomenon corresponding to the perceived pleasantness of simultaneously sounding musical notes. Many competing theories of consonance exist in the literature, but recent work has settled on a periodicity explanation (Cousineau, McDermott, & Peretz, 2012; McDermott, Lehr, & Oxenham, 2010; McDermott, Schultz, Undurraga, & Godoy, 2016). We contend, however, that periodicity theories are insufficient to explain important results in the literature, and that consonance is instead likely to comprise multiple psychological mechanisms, including periodicity, spectral interference, and cultural familiarity. We formalise this possibility in a programme of computational modelling, re-analysing consonance perception data from four previous behavioural studies, and modelling three Western musical corpora representing more than 100,000 compositions. Our results support a composite theory of consonance perception, and result in a new computational model that predicts the consonance of musical chords from periodicity, spectral interference, and cultural familiarity. We release this model in an open-source R package, "incon", alongside 15 other consonance models from the literature. We hope that this work will support future psychological and musicological research into consonance.

References

Cousineau, M., McDermott, J. H., & Peretz, I. (2012). The basis of musical consonance as revealed by congenital amusia. *Proceedings of the National Academy of Sciences*, 109(48), 19858–19863.

McDermott, J. H., Lehr, A. J., & Oxenham, A. J. (2010). Individual differences reveal the basis of consonance. *Current Biology*, 20(11), 1035–1041.

McDermott, J. H., Schultz, A. F., Undurraga, E. A., & Godoy, R. A. (2016). Indifference to dissonance in native Amazonians reveals cultural variation in music perception. *Nature*, 535(7613), 547–550.

FLASH TALKS SESSION 2

Merve Akca
University of Oslo

Auditory Attentional Blink and Expertise: Who Has the Advantage?

Attending to goal-relevant information can leave us metaphorically 'blind' or 'deaf' to the next relevant information while searching among distractors. The *Attentional blink* (AB; Raymond, Shapiro, & Arnell, 1992) refers to the phenomenon that of two targets presented in close temporal proximity, people often fail to report the second one after identifying the first correctly. As extensive musical training is known to provide benefits for high level processes, also beyond the trained skill, expert musicians may have a cognitive advantage in how they deploy their attention in time. Furthermore, this advantage might be more pronounced when searching for auditory targets relating to their (musical) expertise. Although there is evidence that certain visual stimuli relating to one's area of expertise (e.g., car images for car experts) can be less susceptible to AB effects, it remains unexplored whether the dynamics of temporal selective attention vary with expertise and objects types in the auditory modality. Using the auditory version of the attentional blink paradigm, the present study aims to tackle this relationship by comparing the AB effects for instrumental timbres (cello and organ tones) and human voice among expert cellist and non-musician participants. The results from this study may have the potential to extend our understanding of the selective auditory attention in relation to musical expertise as well as perceptual expertise in general.

References

Raymond, J. E., Shapiro, K. L., & Arnell, K. M. (1992). Temporary suppression of visual processing in an RSVP task: An attentional blink? *Journal of Experimental Psychology: Human Perception and Performance*,18(3), 849-860.

David Baker

Louisiana State University

What is going on in someone's head when they do melodic dictation?

Teaching melodic dictation involves instructing students on what and where to direct their attention in order to improve their abilities. This process has been formalized by Gary Karpinski into four discrete steps of hearing, memorizing, understanding, and notating, which help students break down the overwhelming amount of mental processes they need to coordinate in order to successfully complete a melodic dictation (Karpinski, 2000). As students' experience increases, they are able memorize larger chunks of music and more easily able to dictate music they once found difficult. But what is going on in the student's minds over the course of aural skills instructions that allows for this growth?

This paper puts forward a computational, cognitive model of melodic dictation with the goal of helping explain how students improve at melodic dictation. The model is based in research from both cognitive psychology (Cowan, 2010) and computational musicology (Pearce, 2005) and incorporates relevant theoretical aspects such as working memory and the structure of the melody itself.

Using a cadential passage from Schubert's Octet in D Major (D. 803), I walk through an iteration of the model and show how the the model's choices aligns with both intuitions of aural skills pedagogues to establish the model's verisimilitude. I then argue the model's implications for teaching melodic dictation and suggest how combining research from music cognition and music theory can help create a more linear path to success amongst students.

Presenting a computational model additionally demonstrates every ontological commitment, thus making it completely amenable to criticism allowing it serve as a point of conversational departure in discussions of best practice for melodic dictation pedagogy. This paper directly address the recurring call (Butler, 1997; Klonoski, 2006; Karpinski, 2000) to address the chasm in research between music cognition and music theory pedagogy.

References

Butler, D. (1997). Why the Gulf between Music Perception Research and Aural Training?. *Bulletin of the Council for Research in Music Education*, 38-48.

Cowan, N. (2010). The magical mystery four: How is working memory capacity limited, and why?. *Current directions in psychological science*, 19(1), 51-57.

Karpinski, G. S. (2000). *Aural skills acquisition: The development of listening, reading, and performing skills in college-level musicians*. Oxford University Press on Demand.

Klonoski, E. (2006). Improving dictation as an aural-skills instructional tool. *Music Educators Journal*, 93(1), 54-59.

Pearce, M. (2005). *The Construction and Evaluation of Statistical Models of Melodic Structure in Music Perception and Composition*, PhD thesis, School of Informatics, City University, London

Efren De la Mora
University of Central Florida

The Effects of Background Music on Learning: A Meta-Analysis

The present meta-analytic study synthesized and integrated outcomes of experimental and quasi- experimental studies examining the effects of Background Music (BM) on human cognitive performance. Research articles, dissertations and conference proceedings published from 2008 to 2018 and studies testing participants from all ages were selected for the current study. Forty-two studies were found to meet the selection criteria and 30 articles were coded and cross-validated based on general characteristics of the reports, types of the BM interventions, characteristics of participants, and statistical outcomes as detailed below as moderators. Forty-three effect size metrics from the 30 studies were included in the analysis. Potential moderators were selected from prior empirical, theoretical and synthesis research, including type of learning outcome, type of music (e.g., instrumental or music with lyrics), the music genre, arrangement of participants, participants' age group, and type of outcome measure. Using fixed and random effect models, the study results revealed a small but positive association between the use of BM while learning and overall cognitive performance. Moderator analyses showed, (a) higher learning performance for participants aged between 1-12 years or 25-44 years when listening to instrumental or classical BM while learning, (b) higher mean effect sizes for studies using standardized measurement instruments compared to studies implementing researcher developed measurement instruments, and (c) no statistically significant differences between mean effect sizes reported by studies that arranged participants in groups comparted to those that tested participants individually. In addition, the results of this meta-analysis suggest that BM might not disrupt memory and recall processes as depicted by prior synthesis research and theoretical propositions. Implications for theory, future research and practice as well as potential limitations are also discussed.

Omer Leshem

The New School for Social Research

Audience members with greater perspective-taking ability more accurately identify musically expressed emotion in a live improvised jazz performance

Do audience members with greater cognitive perspective-taking more accurately identify an emotion that a jazz improviser intends to express during a performance? And are audience members with greater affective empathy more likely to feel the same emotions as the performer? This study explored these questions in a full-length solo improvised concert by pianist and Grammy nominee Andy Milne held at the Glass Box Theater, home of leading NYC jazz venue "The Stone." Cognitive and affective reactions of audience members who were willing to participate (and thus reimbursed their ticket price after the concert, n = 23) were measured as non-intrusively as possible.

The method involved instructing the performer (who was unaware of what the manipulation would be) mid-performance with a paper note asking him to "perform a 3-5-minute improvised piece with the intention of conveying sadness." Immediately afterwards, participants and the performer responded to a paper-and-pencil questionnaire from a first envelope under their seat. Participants first described the emotion the performer had intended to express using their own words, and then they selected the intended emotion from a list. They also reported the emotions they had felt while listening using Izard's Differential Emotions Scale (DES). At the end of the concert, participants answered demographic questions and filled out Davis' Interpersonal Reactivity Index (IRI).

Findings demonstrate that audience members with greater cognitive perspective-taking ability (n = 16) were more likely to accurately identify sadness as the expressed emotion, and less likely to overlap in felt emotion with the performer (who did not report feeling sad). Audience members who accurately selected "sadness" reported feeling marginally sadder than people who did not select sadness. Results replicate findings from solo lab studies in a concert setting, and demonstrate the viability of exploring empathy and collective cognition in an improvised live performance.

Rémi De Fleurian, Marcus T. Pearce
Queen Mary University of London

Effects of stimulus properties, stylistic preference and familiarity on musical chills

Musical chills give a convenient insight into what makes music pleasurable because they are widespread, memorable, and observable. Changes in dynamics, texture, melody, harmony, rhythm, and instrumentation have been linked to chills, but few studies have looked at the causal influence of such factors. More specifically, it is unclear whether chills can be felt when listening to any piece of music, or whether they require a specific combination of stimulus-driven properties. Potential effects of stylistic preference and familiarity have also been proposed, but sparsely explored as of yet. In the present study, 93 songs were extracted from a previous survey study in which 221 participants reported songs during which they often experience chills. Each song was then matched with three similarly popular songs from the same artist. Participants took an online test in which they listened to randomly selected 15s. excerpts for 40 songs and their associated matches, and rated them on liking for the genre of each excerpt and familiarity, resulting in an individual set of 12 unfamiliar songs for each participant, containing three songs for each combination of song provenance (survey or matched) and liking for the genre (liked or disliked). Participants listened to the 12 songs in two lab sessions, separated by a two-week longitudinal phase away from the lab, during which they listened to the full set of songs another eight times. In each lab session, piloerection was measured using a wearable optical device, and participants continuously reported the occurrence of chills and of intensely pleasurable moments using button presses. While data collection is still ongoing, preliminary results suggest higher occurrences of piloerection, self-reported chills, and intensely pleasurable moments for songs taken from the survey dataset, songs in liked genres, or with repeated listening. These preliminary results are discussed in relationship to musical expectancy.

Diana Kayser, Hauke Egermann

University of York

Are musical emotions different from emotions experienced in everyday life?

Background Utilitarian emotions have been in the foreground in research on experienced emotions in music. However, Scherer (2004) suggests that music evokes a wider scope of emotions, including aesthetic and epistemic emotions that lack the activation of the physiological reaction component due to their lack of associated behavioral tendencies.

Aims In this study we wanted to see whether self-reported aesthetic emotions evoked by music are accompanied by physiological changes normally associated with utilitarian emotions. We tested whether distinct facial expressions of emotion and physiological changes predicted participants' subsequent ratings on the Aesthetic Emotions Scale (AESTHEMOS), which has been developed by Schindler, Hosoya and Menninghaus (2017) to assess experienced emotions in an aesthetic context such as listening to music.

Method In a laboratory experiment 39 participants (14 males, mean age 28 years, range 19-61 years) listened to 15 excerpts of film music alone, via headphones. We measured galvanic skin response, movement energy, heart rate, and took video recordings of participants' faces. Facial expressions of emotion were subsequently classified using automated face analysis software. Participants were asked to retrospectively rate their felt emotions on the AESTHEMOS.

Results Results of the indicate that the AESTHEMOS-factors negative emotions, aesthetic emotions, animation, sadness, and nostalgia/relaxation could be predicted by changes in GSR, HRV, movement energy and distinct facial expressions.

Conclusion Results show that some aesthetic emotions are accompanied by embodied components and can be predicted by various physiological changes normally associated with utilitarian emotions. We therefore conclude that physiological changes in various body activation parameters influence retrospective ratings of aesthetic experience. These findings therefore question the simple dichotomy between utilitarian embodied and aesthetic non-embodied emotions.

Ugne Peistaraite

Royal College of Music

Emotion Regulation Processes Can Benefit Self-Regulated Learning in Musicians

Self-regulated learning (SRL) is the degree to which students are metacognitively, motivationally and behaviourally active participants in their own learning process. It involves the self-regulation of cognitive, behavioural, and affective processes. SRL holds significant potential for enhancing practice and achievement. Although affect is acknowledged as one of the three fundamental processes in SRL, there is limited research investigating it. However, emotions have been found to influence SRL efficiency while emotion regulation (ER) can impact on learning outcomes. Thus, this study sought to investigate how ER processes relate to SRL in professional musicians. Four forms of regulation (reappraisal, suppression, rumination, repression) were examined in relation to the SRL three-phase model. 334 professional musicians of 39 nationalities (age: 18-66 (M=28); female=215; male=119) completed a survey comprising the *Self-Regulated Learning in Musicians Questionnaire*, the *Emotion Regulation Questionnaire* and demographic information. A significant positive correlation emerged between SRL and reappraisal and significant negative correlations between SRL and the other three processes. Further multiple linear regression analysis revealed reappraisal, repression, practice hours and expertise accounted for 25% of the variance in SRL. Finally, a factorial (2x2x2) ANOVA yielded significant group differences on ER in gender, expertise, and occupation. Results suggest that reappraisal can enhance the use of SRL in musicians, thus highlighting the potential utility in considering ER as part of SRL. The main practical implication is to design learning environments that would educate musicians on how to be self-regulated learners with inclusion of ER strategies.

POSTER ABSTRACTS

Patrick Avery
Royal College of Music

In what way does audio-visual feedback of practice influence self-regulated learning?

SRL has shown to be important in musical development and students who are better able to self-regulate often achieving higher performance standards. Two key processes of SRL are goal setting and evaluation. Studies into self-evaluation have examined the evaluation of musical performance and not the practice processes; these have relied on the use of audio recordings alone. However, audio-visual feedback of practice has shown to be beneficial within the general expertise literature. This study investigated whether audio-visual feedback of practice sessions would affect SRL processes in conservatoire students. The participants (n=3) learned two pieces separately with each learning phase consisting of 4 practice sessions and a performance. All sessions were recorded audio-visually. When learning the piece one, they practiced normally but when learning piece two they were required to watch their practice back immediately after the session. Interviews were conducted before the study and immediately after each performance to ascertain typical practice approach, understanding of SRL, the effects of being recorded (phase 1) and effect of watching their practice back (phase 2). Pre- and post-session questionnaires measured self-determined goals for the session, motivation to practice, goal achievement, self-satisfaction of practice, and reason for the self-satisfaction rating. Results revealed that students had mixed understanding of the nature and importance of goal setting in self-regulation and, as such, displayed limited practice and learning strategies. Practice evaluation centred on sensory-perceptual feelings rather than goal attainment. Effects of video observation revealed differences between self-perception and reality of practice. Observation of practice had a negligible effect on self-satisfaction scores and was independent of goal attainment. Observing ineffective practice strategies on video had little impact on SRL overall, supporting existing literature that students need instruction on effective practice. However, audio-visual recording of practice may prove useful from a pedagogical standpoint for teachers.

Anagha Bhat
Indira Gandhi national Open University

'A Cyclical Poem?!' Understanding how music perception and responses change according to the time of day

A Musical experience is inherently tied to time. One of the unique facets of the classical music of India, is its Raga-Time theory, that assigns a specific period of day for performing each melody form, or a raaga to maximise the intended emotional effect.

There is a dearth of any empirical basis and there clearly is a lack of lucidity regarding the roots & rationale of this theory, although it stands in practice till date amongst the practitioners of North Indian Music .

Mood cylicity studies suggest that mood, and therefore emotions change over time in intensity and quality, and these emotional changes covary with changes in psycho-physiological measures.

We also know that musical meaning and emotion depend on how the actual events in the music play against this background of expectations & memory.

Current studies that are attempting to account for the complete range of emotions, including the revised comprehensive framework – BRECVEMA (Brain Stem Reflex, Rhythmic Entrainment, Evaluative Conditioning, Contagion, Visual Imagery, Episodic Memory, Musical Expectancy and Aesthetic Judgment), consider the key to be the psychological mechanism that mediates between the musical event and the listener experiencing the music.

Is it possible that the time plays a crucial role in predisposing listeners in a certain way in some of these core elemental aspects? What role would 'Time-Entrainment' play? We posit that The Raga-Time theory could hold a vital clue.

With an interdisciplinary standpoint ,we are attempting to probe further by exploring how the perception of Raaga music, the comprehension of a complex musical scene comprising of sources, events, sequences, and musical structures and the emotional responses thereby, change, with the changing time cycles of the day across different scenarios.

Kate Cameron
University of Leeds

A Method to Evaluate the Impact of Music Tuition on Children's Emotions

Justifications of music education are often founded on beliefs about the impact of music beyond instrumental skill and musical knowledge. While the impact of music tuition on measurable outcomes, such as school attainment and attendance, can be relatively easily assessed, other areas are often harder to monitor. This paper focuses on the potential impact of instrumental tuition on children's moods and emotions. The research, scheduled for January and February 2019, is based in one primary school in Leeds. Children in this school receive instrumental tuition through the Opera North *In Harmony* programme. This paper explores the implications of different theoretical concepts of emotion and the practicalities of conducting such research with children. For this purpose a research process consisting of three phases has been established. This process makes use of focus group discussion, whole class survey and individual interviews. Each phase seeks to obtain data that establishes the emotional experiences of the children involved while also scrutinizing the tools in use. The research outcomes are therefore considered from two perspectives: (1) the impact of music tuition on the emotions of children in the *In Harmony*, Opera North programme; and (2) the efficacy of this proposed method of evaluation. The paper concludes with recommendations for further development of these research tools before considering the potential contribution to the evaluation of arts education.

Diogo Carvalho
University of Florida

"Open the Bruise Up": Identity and Memory in Steve Reich's Music

When Steve Reich appropriated the speech of a teenage boy—linked to the Harlem Six who had been harshly beaten by the police—to compose the phase tape piece *Come Out* (1966), he not only established a new compositional technique, but also granted those events a permanence in time. The analysis of Reich's early pieces generally focuses on compositional processes and addresses minimalist music's opposition to or development of modernism, with its parallels to the minimalist visual arts. (cf. Reich, Brown, McClary, Mertens, Schwarz). Martin Scherzinger, on the other hand, questions the visual arts associations and stresses the African musical ideas in *It's Gonna Rain* (1965). It is time, however, for the narrative content, which is directly linked to issues related to the civil rights movement and racial identity, to be examined.

In this paper I argue that *Come Out* alludes to the historical 1960s events in two levels: the life of the subjugated boy and the cultural memory of African-American struggles. I propose that Reich gives those moments a sense of permanence in time. In crafting the piece, Reich made a slightly shorter copy of the original recording (the musical object) and played both back simultaneously; because of the different durations, the recordings get progressively out of phase, to a point where speech becomes pure sound. Using Paul Ricoeur's hermeneutics of history, I suggest that Reich's controlled elimination of the text's semantics reveals the musical subject, the suppression of the African-American man's identity (voice). *Come Out* literally deconstructs Daniel Hamm's identity, but the piece carries a deeper message that reconstructs a distant past every time the work is performed and that past should be remembered and understood (cf. Assmann and Czaplicka). In essence, Reich makes the struggles of the past a living presence through his music.

Katerina Drakoulaki
National and Kapodistrian University Athens

Exploring the rhythmic abilities of Greek-speaking children with Developmental Language Disorder: Evidence from correlational and priming studies

A link between rhythm and grammar skills has been speculated. Studies in developmental disorders have shown that children with dyslexia and developmental language disorder (DLD) have difficulties detecting amplitude modulations, beat perception and sensorimotor entrainment. These difficulties are correlated with performance on language and literacy tasks (Corriveau & Goswami, 2009; Corriveau, Pasquini, & Goswami, 2007; Cumming, Wilson, & Goswami, 2015; Cumming, Wilson, Leong, Colling, & Goswami, 2015). A correlation between typically developing children's performance on a rhythm perception task and a morphosyntax connected speech task has also been found, with implications for language-impaired children (Gordon et al., 2014; Gordon, Jacobs, Schuele, & McAuley, 2015). Priming studies with metrically regular rhythm primes seem to facilitate DLD children's performance on grammaticality judgment tasks (Bedoin, Brisseau, Molinier, Roch, & Tillmann, 2016; Przybylski et al., 2013). Will the performance of Greek-speaking children with DLD on rhythm assessment batteries be correlated with their performance on language tasks? Also, will metrically regular rhythm primes facilitate their performance on a relative clause comprehension picture-selection task?

Twenty children with DLD aged 5;6-6;6 will be recruited. A control group of equal participant numbers for age matching will be employed.

The correlational study will look into linguistic tasks assessing phonological awareness and morphosyntax perception and production. For rhythm skills, cBAT (Einarson, 2017) will be administered. Verbal and visuospatial working memory will be assessed. The priming study will examine the effect of a rhythmic prime on the comprehension of syntactic structures difficult for the DLD population. Firstly, a group effect is hypothesized; that is, the performance of DLD children on both linguistic and rhythmic tasks will be significantly worse than controls. An interaction between the performance on the linguistic and rhythm tasks is also expected. A type of prime effect is expected; all children should benefit from the regular prime.

References

Bedoin, N., Brisseau, L., Molinier, P., Roch, D., & Tillmann, B. (2016). Temporally Regular Musical Primes Facilitate Subsequent Syntax Processing in Children with Specific Language Impairment. *Frontiers in Neuroscience*, 10, 245.

Corriveau, K., & Goswami, U. (2009). Rhythmic motor entrainment in children with speech and language impairments: tapping to the beat. *Cortex*, 45, 119–130.

Corriveau, K., Pasquini, E., & Goswami, U. (2007). Basic auditory processing skills and specific language impairment: a new look at an old hypothesis. *Journal of Speech, Language, and Hearing Research*, 50, 647–666.

Cumming, R., Wilson, A., & Goswami, U. (2015). Basic auditory processing and sensitivity to prosodic structure in children with specific language impairments: a new look at a perceptual hypothesis. *Frontiers in Psychology*, 6, 1–16.

Cumming, R., Wilson, A., Leong, V., Colling, L. J., & Goswami, U. (2015). Awareness of rhythm patterns in speech and music in children with specific language impairments. *Frontiers in Human Neuroscience*, 9, 1–21.

Einarson, K. M. (2017). Beat perception and synchronization abilities in young children (PhD Thesis). Gordon, R. L., Jacobs, M. S., Schuele, C. M., & McAuley, D. J. (2015). Perspectives on the rhythm- grammar link and its implications for typical and atypical language development. *Annals of the New York Academy of Sciences*, 1337

Gordon, R. L., Shivers, C. M., Wieland, E., Kotz, S. A., Yoder, P. J., & McAuley, D. J. (2014). Musical rhythm discrimination explains individual differences in grammar skills in children. *Developmental Science*, 1–10.

Przybylski, L., Bedoin, N., Krifi-Papoz, S., Herbillon, V., Roch, D., Leculier, L., ... Tillmann, B. (2013). Rhythmic auditory stimulation influences syntactic processing in children with developmental language disorders. *Neuropsychology*, 27(1), 121– 131.

Deniz Duman

University of Jyväskylä

To Close The Eyes Or Not: The Effects Of Alpha Power As Induced By Eye Closure On Auditory Entrainment

Neuronal oscillations facilitate extracting sensory information from the environment through optimization of rhythmic fluctuation in excitation and inhibition cycles of neurons; which is defined as neural entrainment. Although research suggests entrainment to frequency modulated (FM) speech-like rhythmic sounds, factors influencing entrainment are still open for discovery. With this purpose, the current work tackled the understudied daily strategy, eye closure, in auditory perception domain. Neural and behavioral effects of eye closure on auditory entrainment were investigated. Eleven participants detected near-threshold gaps (sound breaks) embedded in 2.8 Hz FM stimuli both eyes open and closed conditions. Electroencephalogram (EEG) data were also obtained from eight of the participants. Eye closure was hypothesized to induce occipital alpha oscillations, associated with decreased neural and behavioral effects of entrainment and results in enhanced gap detection performance compared with eyes open condition. Results revealed that, as hypothesized, eye closure increased occipital alpha power. Moreover, increased 2.8 Hz neural activity and participants' modulated behavioral gap detection performance suggested neural and behavioral auditory entrainment to 2.8 Hz FM sound stimuli both in eyes open and closed conditions. Contrary to the main hypothesis, closing the eyes did not influence the overall gap detection performance. However, first evidence of auditory entrainment under eye closure condition was provided. Although the current data have limitations, all in all, an interaction of two distinct auditory perception mechanisms - neural entrainment and cortical alpha band oscillations - are suggested to involve in perception of speech-like sound stimuli. Further, this interaction was proposed to influence auditory perception differently under eye open and closed periods, raising a firm background for further research on possible benefits of eye closure on sensory information processing.

Claudia Fernández de Cañete García
Royal College of Music

An approach to Music as a Medium of Instruction in the teaching of English as a second language: An experimental study comparing students with previous musical training and a control group

Abundant research supports the idea that musical training improves to a large extent the development of hearing ability in children. This auditory development is linked to an enhancement in the language learning process, mainly in the oral and aural skills (Magne et al., 2006; Hyde et al., 2009). The implementation of a new methodology, Music as a Medium of Instruction (MMI) - based on EMI theory features - takes advantage of the benefits that music provides in the teaching of English as a second language, leading to more efficient results. The differences in terms of progression between students with previous musical training and non- musician students is also detailed throughout the practical case study of this research, which experimental design provides an in-depth analysis. The results come from an analysis of the confidence interval, built with quartiles based on t-distributions governing each of these groups, and a probability calculation of the MMI method success presenting different dimensions of the study.

The results obtained reveal that MMI methodology stands out for its improvement in the oral and aural learning process. Students enjoy with music in lessons and therefore more receptive learning come to fruition. The ability to motivate and the entertaining spirit that music awakens in students, make the teaching-learning process a rewarding experience where they learn and teachers instruct significantly through action and fun. The development and implementation of this methodology within the school curriculum would lead to performance enhancement in the teaching of a second language.

Christoph Finkensiep
École Polytechnique Fédérale de Lausanne

Representing Hierarchical Voice-Leading Structure with Graph Transformations

Linear connections between notes are fundamental for both perception and composition of music. In the context of composition frameworks such as counterpoint and part writing, a piece is organised in a fixed number of simultaneous lines (or voices) that move in steps and leaps. Using these frameworks to analyse music that is not explicitly organised in voices is not straightforward. Such music might, however, still expose voice-like structures and follow voice-leading principles. Schenkerian analysis introduces an extended notion of lines that can span both long and short distances in time, usually move stepwise, and are hierarchically organised. Examples include the *Urlinie* (principal line), but also short-term lines that connect the *Urlinie* with inner voices.

The work presented here aims to provide a formal representation of the voice-leading structure in a piece of music where lines are represented as paths in a graph (i.e., a network of notes). Such a graph can be derived using transformations that correspond to stepwise movement such as neighbour notes and passing notes. By encoding hierarchy implicitly as a derivation, this approach resembles reductional analysis and can be formally understood as a graph grammar.

While previous approaches in this direction follow Schenkerian analysis in focusing on a principle line, the graph-based approach represents all lines in the piece equitably and is thus more informative about the structure of voices below the principal line. Since the existence of an *Urlinie* is not presupposed, this method can also be applied to music for which traditional Schenkerian methods are stylistically not appropriate. This opens up future research directions on inference of voice structure from notes and computational modeling of hierarchical voice perception.

Edward Hall
Queen Mary University of London

Approaches to Large-Scale Structure Through Statistical Learning

An overview is given of research intended to tackle the perception of large-scale structure in music through the concepts of structural coherence and thematic development, exploring the cognitive mechanisms facilitating the perception of coherence – how structure can be made up using small repeated salient features and their development. The problems experienced in much of the literature exploring large-scale structure and its related properties of repetition and similarity mean that no convincing cognitive model of structure has been produced; the outcomes have been inconclusive with many facing methodological shortcomings and a lack of consideration of internal cognitive processes. Much of this gap can be addressed by considering statistical learning; motivic salience and repetition can be understood in terms of predictions made by a listener as a piece progresses, their development can be viewed as variation according to intra-opus thematic rules or extra-opus stylistic congruity. The repetition, and thus the strengthening, of salient material in a statistical model can be considered as a mechanism by which large-scale structure and coherence is achieved.

Four hypotheses are put forward that map out the psychological processes for the perception of large-scale structure: 1. that the material most repeated is the most salient; 2. that frequent repetition of salient material affirms structural coherence through the re-enforcement of statistical grammars; 3. that repeated material does not have to be exact to achieve coherence, variations according to extra-opus style and intra-opus development may be present; and 4. that intra-opus thematic development increases the sense of structural coherence. The implications of these mechanisms for the perception of large-scale musical structure are discussed, as well as the research planned to ascertain their soundness.

Cristina Harney, Jelena Havelka, Freya Bailes, Judith Johnson
University of Leeds

Do different music listening situations have an impact on listening experience in a student sample?

The situation in which we listen to music, and the impact this has on anxiety levels, is still unknown. Due to the infancy of the research area, the present study is exploratory and hypothesis two-tailed. The present music listening intervention will include 2 conditions: a group and an individual listening session to address this gap in the literature. The sample will comprise of healthy students from the University of Leeds. Relaxing, instrumental music will be presented to students at a duration of 36 minutes, which is in line with previous music listening interventions. A repeated measures, counterbalanced design will be utilised. Changes will be assessed through State Trait Anxiety Inventory (STAI) and Visual Analogue Scales (VASs) in mood and anxiety outcomes at baseline, prior to and post the music sessions. Further data will be collected through self-report questionnaires assessing the different experiences of the sessions such as enjoyment of the music and general music related behaviours. Findings will inform a basis for future music listening interventions for reducing anxiety.

Hayley Janes
University of Cambridge

Disrupting the Dominant Discourses of 'Dead White Men': Imagining 'Cultural Humility' in Postsecondary Music Education

I felt dissatisfied with the way that 'culture' was approached in my undergraduate degree in music education. There was a lack of continuous and critical engagement with perspectives outside the Western tradition. Attempts to move beyond the dominance of the Western canon were, at best, tokenistic. I was left feeling ill-prepared to teach in contemporary society amidst the current entanglement of cultures. The importance of preparing graduates to actively and sensitively engage with the cultural climate and pluralism of today's society is prominent within the music education literature (see for example, Bradley 2015, Robinson 2017, Westerlund & Karlsen 2017). There is also a general agreement that postsecondary programs should decenter or, in other words, depart from the exclusive focus on the Western classical tradition. However, there is a lack of consensus and empirically grounded frameworks for operationalizing this change within practice. A significant shift is needed as suggested by scholars such as Randall Allsup (2016), Heidi Westerlund (2017), and Juliet Hess (2015, 2018). This type of shift would require disrupting a deeply entrenched pattern of focus in music education. I will argue that the practice of 'cultural humility' (Tervalon & Murray-García, 1998) should be included in postsecondary music education to frame and support this process of disruption. My research explores what constitutes 'disruption' and how such a process can be interwoven throughout a postsecondary music education program, drawing upon cultural theorist and sociologist Pierre Bourdieu, the concept of 'cultural humility', and the theory of 'critical creativity' (McCormack & Titchen 2006, 2010). In this presentation I will present and critically discuss preliminary results regarding this interdisciplinary, arts-based exploration. I will make explicit the interconnectedness of theory, practice, and policy reform for performing and embodying 'cultural humility' in music education.

Sebastian Klaßmann
University of Cologne

Linear Expectations: Interfacing Jazz Improvisation and Harmony using Combinatory Categorial Grammar

Philip Johnson-Laird (2002) suggests that tonal, melodic improvisation must be directly linked to a harmonic consensus of interacting musicians that is in turn based on a representation of the underlying compositional constituents of the piece being performed. Modelling harmonic structures by means of using formal methods from computational linguistics is nothing new. However, when specifically looking at jazz from this perspective, melodic improvisation is a major constituant of performance and yet remains mostly unreflected upon – there appears to be no real methodological interface between it and syntactic models of harmonic progressions. Larson (2002) receives linear improvisation as being based on expectation, resolution and surprise which are in turn dependent upon a contextual function of a given melodic unit. From a harmonic perspective, a *combinatory categorial grammar* (CCG, cf. Steedman, 1996; Granroth-Wilding, 2013; Granroth-Wilding & Steedman, 2014) formally integrates this notion. This presentation focusses on early ideas regarding potential structural interfaces between harmonic consensus and melodic extrapolation which form the basis of my PhD research. This approach seeks to incorporate the notions that improvised melodies in jazz mostly make sense on a cellular level – i.e. in terms of local combinations of short note sequences as proposed by Frieler et al. (2016) – and that by recombining archetypical melodic cells, convincing lines in the jazz idiom can be generated (cf. Ligon, 1996; Vincent, 2015). The main goal of this presentation is to discuss the possibility of understanding these melodic cells as belonging to complex syntactic categories, which directly interface with and are dependent on a structural harmonic representation that can be described by means of the CCG formalism. These concepts will be discussed based on my own analysis and annotations of melodic cells offered by Vincent (2015), as well as transcriptions taken from the Weimar Jazz Database (cf. Pfleiderer et al, 2017).

References

Frieler, K., Pfleiderer, M., Zaddach, W. G., & Abeßer, J. (2016). Midlevel analysis of monophonic jazz solos: A new approach to the study of improvisation. *Musicae Scientiae* (2),143-162.

Granroth-Wilding, M. (2013). *Harmonic analysis of music using combinatory categorial grammar*. Ph.D. dissertation, University of Edinburgh.

Granroth-Wilding, M., & Steedman, M. (2014). A robust parser-interpreter for jazz chord sequences. *Journal of New Music Research*, 43(4), 355-374.

Johnson-Laird, P. N. (2002). How jazz musicians improvise. *Music Perception*, 19(3), 415-442.

Larson, S. (2002). Musical forces, melodic expectation, and jazz melody. *Music Perception*, 19(3), 351-385.

Ligon, B. (1996). *Connecting chords with linear harmony*. Hal Leonard Corporation.

Pfleiderer, M., Frieler, K., Abeßer, J., Zaddach, W. G., & Burkhart, B. (2017). *Inside the Jazzomat - New Perspectives for Jazz Research*. Schott Campus.

Steedman, M. (1996). The blues and the abstract truth: Music and mental models. In A. Garnham, & J. Oakhill (Eds.) *Mental models in cognitive science: Essays in honour of Phil Johnson-Laird*, 305-318.

Vincent, R. (2015). *Jazz Guitar Soloing - The Cellular Approach*. Sher Music Corporation.

Can Lu
University College London

Singing competency of Primary school students in Hunan and Guangdong province, China

Singing is a common place activity for Primary school aged children in school, home and wider community settings. While many research studies have focused on children's singing behaviour and development, limited research has been undertaken in mainland China. Consequently, a quantitative-based study was conducted 2017-2018 which generated n=1608 singing assessments, mainly from children in Hunan province, China and some from Guangdong province (n=46). The proposed presentation reports participants' singing competency by age (6-13yo) in half-year categories, drawn from seven schools. Variables included relative economic status (higher and lower income), and geographic location (urban and non-urban). The number of female assessments was n=787 (49%). One-third of participants were assessed twice, once each year (2017-2018). Children sang three criterion songs, *Twinkle, Twinkle, Little Star*, a Chinese nursery song *Little Donkey*, and *Happy Birthday*. All sung performances were audio recorded. After fieldwork, sung data were analysed using two developmental measures: Vocal Pitch Matching Development (VPMD) (Welch, 1998), and another scale used for measuring vocal registers and vocal range, the Singing Voice Development Measure (SVDM) (Rutkowski, 1997). The singing data were normalised and analysed by age in half- years using One-way ANOVA. Overall, findings suggested that participants' normalised singing competency (a combination of both measures) was significantly different by age ($F_{(14, 1492)}$=10.02, p<.0001). Older participants could significantly match pitch better than younger participants ($F_{(14, 1493)}$=9.331, p<.0001) (cf. Welch, 1998), and older participants also showed better skills in using their singing voice ($F_{(14, 1493)}$=9.992, p<.0001) (cf Rutkowski, 1997). The current findings in terms of the age variable are similar to the trend in singing development reported in the Sing Up data for approximately 11,000 English children in the same age range. More details related to other variables will be reported in the presentation.

Pablo V. Marquine
University of Florida

Claudio Santoro, Música Viva, and the Emergence of German Modernism in Brazilian Music

In 1941, Claudio Santoro (1919-1989) joined *Música Viva*, a group of composers led by the German composer Hans-Joachim Koellreutter, who, following a model from the Second Viennese School, found a school of modern music in Brazil. Within the group's output, Santoro's *Sonata 1942* for piano was most influential, as it established the twelve-tone technique into a viable musical language for avant-garde music within an environment marked by blatant nationalism in music (cf. Kater and Behague). As a result, the activities of the group Música Viva resulted in a ferocious response from critics, the press, and the nationalist composers. Advocating for the continuation of a national style, Camargo Guarnieri responds to the group in his seminal letter *Carta Aberta* (*Open Letter*, 1950), where he questions the aesthetics of modernity as antithetical to the affirmation of a Brazilian musical identity.

In this paper, I argue that, as the German musical modernism becomes a source of Brazilian avant-garde through Koellreutter, Santoro paves way for dodecaphonic serialism, one that eventually contributes to the Brazilian musical identity. In this paper, I examine how Santoro's Sonata 1942 is a unique musical work that embodies the modern style advocated by *Musica Viva*, but in Santoro's own idiosyncratic ways, particularly the handling of the series. Supplemented by his unpublished autobiographical interview, archival correspondences, and the music manuscript, Santoro's approach of dodecaphonism in the *Sonata 1942* was fulfilled with a "lack of orthodoxy systematization" — a feature often criticized in the literature. I argue, however, that Santoro's use of dodecaphonism is systematic, and furthermore, his embodiment is dialectical in two levels: its embodiment of dodecaphonism is fulfilled with a conscious level of serialism but also has a direct connection with form, rhetoric, and musical expression, which exemplifies the genesis and the aesthetics of the avant-garde in Brazilian music.

Annaliese Micallef-Grimaud
Durham University

Altering Emotional Expression in Music

This paper focusses on the relationship between music and emotion perception. It aims to identify what properties in the structure and expression of a musical composition contribute to the conveying of different perceived emotional expressions to the listener. Although research on music and emotions has been carried out for over a century, several key issues have yet to be resolved. This study identifies three main limitations of the previous studies; familiarity bias of the musical examples used, balance between experimental control whilst retaining ecological validity of stimuli, and limited and pre- defined set of musical manipulations utilised in experiments testing the impact of tempo, mode and other musical parameters. To simultaneously tackle all these issues, an analysis-by-synthesis approach is taken, where participants are presented with unfamiliar musical pieces and instructed to alter several musical parameters of each piece depending on how they think the parameters will contribute to the specific emotional expression. For the approach, several short musical pieces were specifically composed and a live-manipulation playback interface called *EmoteControl* was created. *EmoteControl* allows participants to alter 6 musical parameters of a stimulus in real time (tempo, mode, pitch, dynamics, articulation, and brightness) using a simple graphical user interface. The ecological validity of the music is maximised by using real instrument samples including actual articulations and register differences of the instruments. The music's integrity is retained as manipulations are made within the limits of the real instrument samples. The results of this experiment will unveil what combinations of musical parameters effectively communicate particular emotions. In this paper, a quick overview of previous studies is given, and the musical parameters manipulated are discussed. A demonstration of *EmoteControl* is presented, featuring specifically composed musical examples. The significance and implications of this study will be discussed within the wider context of emotion communication in music.

Jonathan Mortimer
Liverpool Hope University

Extended phenotypes, constructed emotions and meaning in music

Music has existed for at least 45,000 years and has spread to be ubiquitous throughout the human species. That this has happened over the life of the species indicates that genomic effects are implicated. This does not mean to imply that there are specific genes for either musical ability or its effect on performers and listeners, but it does imply that humans possessing certain genomic makeups possessed, either directly or indirectly, a survival advantage in early human societies. In many ways the human need for music displays similarities to addictive behaviours in that few humans would either consciously or unconsciously do without it.

Dawkins proposed that phenotypes of genes extend beyond their biological function (e.g. protein synthesis) and through the resulting behaviour expressed by their organism affect the surrounding environment. As part of his argument he proposed that the nervous systems of various species are susceptible to drug like influences from visual or auditory stimulation. Numerous physiological responses to music are known and these are interpreted by our brains as emotions. We appear to require both the continuous supply of new music as well as repetition of that we have heard before.

Work by Barrett and others has shown that emotions are not fixed hard wired but arise from the brain's response to sensory input. Interpretation arises from concepts developed by predictions based on prior experiences of the recipient. This paper explores the relative contributions of composer, performers and listeners to emotion and meaning in music from a biological perspective and the extent to which they are able to share that meaning. Does the composer manipulate the emotional response of the performers or listeners, or do we create our own meaning when we listen?

Fabian Moss
École Polytechnique Fédérale de Lausanne

Inferring Tonality from Note Distributions - Why Models Matter

The present approach aims at bridging mathematical music theory and computational music analysis by combining formal models of tonal space and statistical analyses of symbolic musical corpora in different representations (neutral and tonal pitch classes).

Computational music analysis necessarily relies on quantified musical data. Although numerical representations of pieces are inevitably reductive, they have the advantage to allow for objective statistical statements under given assumptions. One of the most common avenues in empirical approaches to music analysis is to study note distributions of pieces or collections of pieces, for instance in applications such as automated key or mode finding, or genre classification. Typically, notes are translated into pitch classes in twelve-tone equal temperament and represented by integers ranging from 0 to 11, allowing for convenient treatment of many digital music resources, such as MIDI databases. Other formats, such as MusicXML, allow for a richer representation of pitches and pitch classes.

This paper argues that the choice of the representation of notes and hence the associated models of tonal spaces fundamentally affects the discovery, analysis, and interpretation of patterns in note distributions (sometimes called 'tone profiles'). It contrasts historical and contemporary models of tonal space, such as the line of fifths, the circle of fifths, and the Tonnetz, and it demonstrates how different representations influence the results. This is shown by (1) comparing a number of individual pieces marking different stages in the history of tonality, and (2) inspecting a musical dataset of more than 1,500 pieces (more than two million notes) ranging from the Renaissance to late Romantic periods, with a strong focus on the nineteenth century. The results reveal large-scale historical changes in the usage of tonal material that would not be visible in reduced pitch representations.

Naomi Nordblom[1], Douglas Macmillan, Stefan Kopp[2]
[1]University of Heidelberg, [2]Goethe University of Frankfurt

The posture during recorder playing

This paper examines the relationship between the shape of the a musical instrument and its effects on the posture of the player, using the recorder as an example. As the player needs to connect to the instrument in order to play it, the instrument determines much of the posture of the player.

To study at this phenomenon, the pedagogical perspective as found in the recorder methods was examined and combined with medical measurements of the posture of the player. Most of the 14 recorder methods which mentioned posture stress its importance for playing the instrument properly. However, these descriptions seldom give more than a basic introduction. Only two recorder methods look at this issue in more detail, mentioning the interdependence of the tensions of different muscle groups.

Then, the influence of different angles at the upper side of the mouthpiece where the upper lip connects to the instrument on the position of the spine and the foot sole pressure have been measured. To measure the position of the spine, rasterstereography with a formetric 4d was used. The foot sole pressure was determined with a diers pedoscan. The results show that all the data that describes a forward-backward change of position of the spine and the foot sole pressure is influenced by the angle of the mouthpiece (e.g. flèche cervicale, flèche lombaire, trunk inclination, distribution of foot sole pressure).

The results suggest that the shape of the mouthpiece can affect the posture when playing a wind instrument. This enables us to develop new designs that favour a natural posture and that are therefore more energy efficient. Considering the importance of a good posture for playing an instrument, the introductory character of the recorder methods shows a need for further research and for communicating its results to instrumental teachers.

Michelle Pretorius
University of the Witwatersrand

Understanding music reception through Samuel Pepys' emotional experience of vocal music in seventeenth-century England
An analysis of selected diary entries from 1660 until 1669

Samuel Pepys' diary provides a first-hand account of his experience while making and listening to music. He was not a professional musician, but he understood music and was able to listen to music with a semi-trained ear. Pepys' musical experiences in everyday life provides an opportunity to study the experience of a listener in an authentic environment. His diary is an account of music-making, response to music as well as the material and social factors conditioning musical activity in England during the years from 1660 until 1669. This study explores one audience member's, namely Pepys', response to the composition and original performance of the music of his time, which is in contrast to the reception of current audiences of music composed in the past and performed by musicians today. His diary shows a deeply emotional experience and provides a unique insight into music reception as it occurred in the past. The focus of this study is to draw on Pepys' diary entries between 1660 and 1669 about his experience while listening to vocal music in late seventeenth-century England, as evidence of music reception from an emotional point of view. This is a historical as well as a music reception study and takes the form of a literature review and a mixed methodology encompassing both quantitative and qualitative research approaches. As Pepys uses language to describe his musical experiences the two models which have been used as a theoretical framework for this study are Russell's circumplex model and Henver's adjective clock. The quantitative results show that in Pepys' experiences of musical events, there were more positive than negative observations and the qualitative results in the majority of his documented listening experiences show that in Pepys' experience of a musical event his affective emotional experience had a positive arousal and a positive valence. In conclusion, his deep love of music built the foundation for this response and Pepys' attitude towards the music of the time influenced the way in which he experienced it emotionally.

Nellinne Ranaweera*, Jane Ginsborg, Alinka Greasley, Zoe Franklin
*Royal Northern College of Music

The role of leisure activities in the wellbeing of musicians: A questionnaire survey

Research in the field of music, health and wellbeing has demonstrated the beneficial effects of music on individuals who do not identify themselves as musicians and amateur musicians who engage in music in moderate amounts (MacDonald, Kreutz, & Mitchell, 2012). Research in the field of music medicine has also demonstrated the negative effects of music on musicians' physical and psychological health and suggested a range of potential coping strategies, e.g. the *Better Practice* strand of Musical Impact (2014-2017). Research in the field of leisure studies has shown that optimal use of leisure time, including structured leisure activities such as musical engagement, contributes to improved quality of life and wellbeing (Brajša-Žganec, Merkaš, & Šverko, 2011). Yet no research has investigated the nature of musicians' leisure activities or their effects on wellbeing. The central aim of the research is to explore three main research questions: 1) How much leisure time do musicians (university music students, conservatoire music students, amateur and professional musicians) have and how they choose to spend it? 2) What kind of musical activities do musicians engage in and how much time do they spend on them? 3) To what extent do music students at conservatoires and universities, and professional musicians find music making in their leisure time beneficial for health and wellbeing? An online questionnaire survey was distributed to professional, amateur and student musicians. Professional and student musicians were recruited at the nine music conservatoires and 54 university music departments in the UK. Amateur musicians were recruited via choral societies, community choirs, bands and orchestras via social media and snow-balling. Quantitative and qualitative results will be presented and discussed.

Andrea Saffirio
Conservatorio S. Cecilia, Rome

The harmonic genius of Art Tatum

Despite Art Tatum is mainly celebrated as one of the greatest piano virtuoso ever, he was also one of the best harmonic innovator of jazz piano. In this talk we will focus on this aspect, through the analysis of a series of transcriptions. We will deeply analyze the characteristic elements of his harmonic language, comparing the reharmonizations and the original harmony of tunes, extrapolating recurring harmonic patterns and principles that can be applied in other contexts, creating a valid support to get closer to the harmonic universe of Tatum.

The main purpose of the research is to demonstrate how much the harmonic innovation brought by Art Tatum in jazz language has been relevant (much more than his wonderful piano technique).

Our method allows to uncover the characteristic elements of Tatum's harmonic language, extrapolating patterns and ideas. We will provide a scheme of the main elements that made his harmonic language so advanced, making it more intelligible. To test the accuracy of our research, we will present a reharmonization of two standards never recorded by Art Tatum. This proves that using the techniques found in this study, is possible to create a convincing and stylistically coherent reharmonization.

Lisa Thorpe
University of Chester

Impact of musical training on implicit memory in older adults.

It is well established that explicit memory declines in healthy ageing adults whilst implicit memory is relatively spared. Making music is one of the essential skills that require the use of implicit knowledge. Previous research focused on the implicit knowledge and learning of young adult musicians and non-musicians on an implicit musical learning task found that both musicians and non-musicians showed signs of both implicit knowledge and implicit learning for musical sequences (Thorpe, Cousins & Bramwell, 2019). Little research has looked at the effect of musical training on implicit memory in older adult musicians and non-musicians. Previous studies have focused on general cognitive abilities of older adult musicians and non-musicians found that musicians outperformed non-musicians on cognitive and non-verbal memory tasks (Amer etal., 2013).

This current study focuses on the impact of musical training on implicit memory and implicit learning in older adults, both musicians and non-musicians. Participants were divided into three groups based on their activity levels and musical status: Musicians, active non-musicians and less active non-musicians. By comparing activity levels, this study was able to analyse whether musical training has benefitted implicit memory and implicit learning or whether it is an active lifestyle in general that benefits implicit memory in older adults. In this study, Sixty-three older adults aged 65 and above, took part in 3 implicit memory tasks; an implicit musical task, a serial reaction time task and a word fragment completion task. Preliminary results show that both musicians and non- musicians showed signs of implicit learning and implicit memory in both the serial reaction time task and the implicit musical task. However, musicians reacted faster than non-musicians overall on both tasks.

Donata Vaitkute, Rose Perkins, Terry Clark
Royal College of Music

Enhancing Success: Mental Toughness in Musicians and Their Use of Mental Skills

Background The degree of success when performing can often be determined by the performer's response to pressurised situations. Research suggests that in these occasions the critical success factor is mental toughness (MT), which represents a capacity to produce high-level performances despite challenges and adversities. Mental skills and techniques are learned abilities and procedures used to carry out specific tasks and achieve goals. Research shows there is a relationship between MT and mental skills use in athletes, and that mental training can increase MT. Similarly, studies show that musicians find mental skills use beneficial. However, there is a lack of research about MT in musicians and how it may be influenced by mental skills use.

Aims This study sought to examine the relationship between MT in musicians and their use of mental skills.

Method A sample of 246 classical music performance students (female=148, male=96; Mage=23.88 years, SD=3.68) completed the Mental Toughness Index, Mental Training Questionnaire and Goal-Setting subscale from the Self-regulated Learning in Music Questionnaire.

Results To determine predictors of reported MT, a multiple linear regression model was run with the six mental skills and techniques subscales (foundation skills, performance skills, interpersonal skills, self-talk, mental imagery and goal-setting) and demographic variables included as independent variables via forced entry. The model was significant explaining 63% of variance. *Foundation skills* (ß=.45), such as achievement drive and self-awareness, *performance skills* (ß=.24), such as energy management and attentional focus, *interpersonal skills* (ß=.11), such as communication and cohesion, *goal-setting* (ß=.12) and *age* (ß=.10), showed significant effects (p<.05).

Conclusions These findings suggest that musicians could benefit from the use of mental skills and techniques. As a result, this could have implications for the higher education training that music students receive because teaching them how to use mental skills and techniques could enhance their MT.

References:

Behnke, M., Tomczak, M., Kaczmarek, L.D., Komar, M., & Gracz, J. (2017). The Sport Mental Training Questionnaire: Development and Validation. *Curr Psychol*. doi:10.1007/s12144-017-9629-1

Gucciardi, D. F., Hanton, S., Gordon, S., Mallett, C. J., & Temby, P. (2015). The concept of mental toughness: Tests of dimensionality, nomological network and traitness. *Journal of Personality*, 83, 26-44.

Hatfield, J. L., Halvari, H., & Lemyre, N. (2016). Instrumental practice in the contemporary music academy: a three-phase cycle of self-regulated learning in music students. *Music. Sci*. doi: 10.1177/1029864916658342.

Adrien Ycart

Queen Mary University of London

Towards defining a perception-based evaluation metric for automatic music transcription

Automatic Music Transcription (AMT) systems convert an audio signal into some form of musical notation, typically a sequence of pitches with onset and offset times in seconds (MIDI-like representation) [1]. Usually, they are evaluated by binary comparison between the transcription and some ground truth: a note is either correctly detected or not [2]. We argue that not all errors have the same influence on the perceptual quality of a transcription, and this should be reflected during evaluation. We thus propose to design an evaluation metric for AMT based on human judgement of polyphonic symbolic music similarity, focusing on Western classical piano music. Relevant evaluation metrics for staff-notation transcription have been introduced [3,4], without addressing pitch content. A metric for MIDI-like AMT was proposed in [5], but focused on specific kinds of errors; we aim to define a more general metric.

We maintain ecological validity by using actual AMT system outputs for real music. Previous studies have asked for similarity ratings, either continuous or categorical, between two musical excerpts [6] but inter-rater agreement was low [7], which we argue reflects both intrinsic variations in human judgement, and difficulty of quantifying music similarity. To improve the latter, we propose ranking pairs of examples by similarity to a third excerpt, as in [5]. Another difficulty is remembering long excerpts for comparison. We propose to investigate the use of visual support, and additional tasks such as identifying sections with highest dissimilarity or the most salient mistakes. Finally, we will develop a computational model consisting of a weighted combination of perceptual features (e.g. harmonicity [8]) and music-theory-inspired features (octave errors, out-of-key notes...) that correlates best with human ratings. This correlation will be compared for new and usual metrics.

This study is in development but we hope to stimulate discussion about optimal experimental designs and perceptual feature sets for the task of evaluating AMT systems.

References

[1] Benetos, Emmanouil et al. "Automatic music transcription: challenges and future directions." *Journal of Intelligent Information Systems* 41.3 (2013): 407-434.

[2] Bay, Mert, Andreas F. Ehmann, and J. Stephen Downie. "Evaluation of Multiple-F0 Estimation and Tracking Systems." ISMIR. 2009.

[3] Cogliati, Andrea, and Zhiyao Duan. "A metric for music notation transcription accuracy." *Proc. of International Society for Music Information Retrieval (ISMIR) (2017)* Retrieval Conference, Suzhou, China, 2017.

[4] McLeod, Andrew, and Mark Steedman. "*Evaluating automatic polyphonic music transcription." ISMIR, 2018*.

[5] Daniel, Adrien, Valentin Emiya, and Bertrand David. "Perceptually-based evaluation of the errors usually made when automatically transcribing music." *Proc. Int. Conf. Music Information Retrieval (ISMIR). 2008*.

[6] Jones, M. Cameron, J. Stephen Downie, and Andreas F. Ehmann. "Human Similarity Judgments: Implications for the Design of Formal Evaluations." *ISMIR. 2007*.

[7] Flexer, Arthur, and Thomas Grill. "The problem of limited inter-rater agreement in modelling music similarity." *Journal of new music research* 45.3 (2016): 239-251.

[8] Harrison, Peter, and Marcus T. Pearce. "An energy-based generative sequence model for testing sensory theories of Western harmony." *19th International Society for Music Information Retrieval Conference*, Paris, France, 2018.

Agata Zelechowska
University of Oslo

The irresistible movement: relationships between listener traits, music features and sound environment characteristics in subtle bodily responses to music

Music, and particularly musical rhythm, is linked with body movement in virtually every culture in the world. Even though the existence of this universal phenomenon is recently being widely discussed and studied using methodologies and approaches from different disciplines of science, several questions remain unanswered. To what extent can we control our physical responses to music and the urge to move? What features of the musical sound are linked to movement? What traits of the listeners make them prone to movement during music listening? And finally, how does the design of the experiment and the way sound is delivered to the listener influence the observed movement? This project aims at studying very small body motion that happens during music listening, such as subtle head motion, body sway, postural adjustments and changes in breathing, mainly with the use of motion capture technology. Extracted musical features of the stimuli and traits of the listeners including personality, empathy and music listening habits are analyzed along with the motion capture data. The project's framework is rooted in the theory of embodied music cognition and draws from findings across various disciplines, such as cognitive psychology and neuroscience, biomechanics, psychoacoustics, and evolutionary musicology, to explain how, why and when music moves our bodies.

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