AMPS 2015: The Art and Science of Music

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Abstracts

AMPS

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Keynote Abstracts and Biographies

Musical development across the lifespan: New theory and application

Jane Davidson

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This paper is focused on Western musical learning contexts. The origins of the work stretch back over 25 years when research collaborations led me to investigate fundamental questions about how and why some young music beginners persist to competency while others cease learning. The investigations revealed that some individuals progress quickly, moving systematically from group to solo lessons, while others achieve only piecemeal experiences, yet still succeed in learning many of the sub-skills involved in music-making. While the nature-nurture debate remained at the heart of these studies, it was evident that pathways to music performance are diverse, with both ad hoc and structured experiences taking place simultaneously and influencing the young learner in highly variable ways. New investigations have begun to transform the developmental psychology of music and the current presentation will explore some of the fine-grain understandings the new models offer. But, most significantly, the presentation will shift from research focused on children to adult learners. With more than a decade of data from learners who started their musical experiences in late adulthood, my own studies show that as people move into the final stages of their lives they are not only highly motivated to engage with new music activities, but their participation displays surprising openness to challenge. In this context, the presentation explores a social psychological line of enquiry to connect self-identity, motivation and collective opportunity to understand musical development across the lifespan. Practical application of the work is also discussed.

Biography

Jane Davidson is Professor of Creative and Performing Arts (Music) at The University of Melbourne and Deputy Director of the Australian Research Council's Centre of Excellence for the History of Emotions. She was Editor of Psychology of Music (1997-2001), Vice-President of the European Society for the Cognitive Sciences of Music (2003-2006), and President of the Musicological Society of Australia (2010 and 2011). She was a member of the Research Evaluation Committee for the Excellence in Research in Australia (ERA) in 2009 and 2012. Her research is broadly in the area of performance studies, with interests in emotion and expression, voice, musical development, and music and wellbeing. She has worked as an opera singer and music theatre director, and was coordinator of vocal studies at UWA over an eight-year period. She has published and performed extensively and secured a range of research grants in both Australia and overseas.

On the importance of timing and rhythm in motor and non-motor behaviour

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Neural correlates of motor and non-motor behavior such as speech and language as well as their dysfunctions are well documented in neuroscience and neuropsychology respectively. However, while the critical influence of timing and rhythm in motor behaviour is clearly recognized, there is very little evidence on their impact in speech and language research (see Kotz & Schwartze, 2010). This is surprising as rhythm and timing (i) play a crucial role in speech and language learning, (ii) can compensate developmental and acquired speech and language disorders, and (iii) further our understanding of subcortical contributions to linguistic and non-linguistic functions. For example, recent neuroimaging and clinical evidence has confirmed the contributions of classical motor control areas (cerebellum (CE), basal ganglia (BG), supplementary motor area (SMA)) in timing, rhythm, music, and speech perception (Chen et al., 2008; Grahn et al., 2007; Geiser et al., 2009; Kotz et al., 2009; Kotz & Schwartze, 2011). We consider serial order and temporal precision to be the mechanisms that are shared in simple and complex motor behaviour (e.g. Salinas, 2009), but also in higher order cognitive functions such as speech and language (Kotz & Schwartze, 2010; 2015). In my talk I will present behavioral and neuroimaging evidence on the role of timing and rhythm in motor behaviour, language learning, speech comprehension, and the compensation of both motor and speech behaviour in clinical populations and embed this evidence in a cortico-subcortical framework encompassing action-perception coupling.

Biography
Professor Sonja A. Kotz is a cognitive and affective neuroscientist, who investigates speech, language, music, and communication and their common ground. More specifically, her research centers on predictive coding and cognitive/affective control in sensorimotor behavior, perception, and higher cognitive functions (see domains above) in healthy and clinical (neurological, psychiatric) populations using behavioral and neuroimaging methods (event-related brain potentials (ERPs), M/EEG-oscillations, and structural/functional magnetic resonance imaging (fMRI)). She recently joined the Faculty of Psychology and Neuroscience at University of Maastricht, The Netherlands as an appointed Chair and Professor in Neuropsychology and Translational Cognitive Neuroscience and leads the Neuropsychology section. She is also a Research Professor in the Department of Neuropsychology at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany and holds an Honorary Professorship in Experimental Psychology at the University of Leipzig, Germany and an Honorary Chair position in Cognitive and Affective Neuroscience at the School of Psychological Sciences, University of Manchester, UK.

Physics of the voice in speech and singing

Joe Wolfe

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Most human culture and civilisation derives from speech, and huge industries are based on processing, compressing, transmitting, analysing, recognising and synthesising it, often using physical models. However, the inaccessibility of the key elements and the absence of a good animal model means that much about the voice is only partly or imprecisely known. The first part of this talk will introduce the physics of speech, beginning with the mechanisms of oscillation of the vocal folds, which modulate air-flow from the lungs, converting DC power into travelling and standing waves in the vocal and subglottal tracts. The talk then turns to the vocal tract resonances that interact with the vocal fold signal to produce the spectral and some of the temporal features that we recognise as speech sounds or phonemes. The last section will overview some of the UNSW lab's research on the voice, including vocal fold oscillation, singing registers, resonances of the vocal tract and its surrounding tissues, and some techniques practised by singers and orators.

Biography

Joe Wolfe has a BSc in Physics from the University of Queensland and a PhD in Applied Mathematics from ANU. Last century, he worked in biophysics, specialising in the thermal physics of cellular ultrastructure, working at Cornell, CSIRO and the École Normale Supérieure in Paris as well as at UNSW, where he is now a professor. At the turn of the century, he and colleague John Smith changed research fields and established a lab using novel measurement technologies to research the basic physics of the voice and musical instruments. Joe has won a number of national and international awards for both his research and his online teaching. In his spare time, he is sometimes a composer of orchestral and chamber music, which has had concert performances on all continents except Antarctica.

Symposium Abstracts
(in order of presentation)

SYMPOSIUM: Music, health and therapy

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Music, Health and Therapy pulls together topics addressing musicians' health, how music practice contributes to general health, and how music is used in therapeutic contexts. Music therapy itself focuses on the use of music to support individuals' achievement of specific goals for improving their physical and mental health. The benefits of general music education can also be seen, for instance, in the improvement of social cohesion through group vocal lessons, or the improvement of cognitive function in older adults through piano lessons. Research also explores musicians as a special risk group who often experience occupational health problems such as performance anxiety. This symposium explores music therapy, education and effects on health and wellness through a series of 5 papers that offer theoretical, empirical and experimental perspectives on 1) How music is used in targeted therapeutic contexts, 2) The effects of music education on general health and use in rehabilitation and 3) health issues that affect musicians specifically. A short panel discussion will follow the presentation of the papers.

Thinning & thickening music: Empowering musical flexibility and responsiveness in clinical musicianship

Oliver O'Reilly

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Many musicians are trained to read music and perform a work as it is written, often with little exposure to playing music without a score (Deas, 2007; Wigram, 2004). This approach can embed a rigidity in a musician's approach to playing music. For music therapists, a certain amount of plasticity is required in the application of music to meet their clients' needs however straying from the score can easily become a distressing ordeal for an accomplished musician that leaves them feeling vulnerable and exposed (Wigram, 2004; Lee, 2003). Bourdieu (2010) considers how an individual's past experience can influence and inform their understanding of their environment. He refers to this notion as habitus. Davies (2001) views musical works as sitting on a spectrum from thick to thin. Thick scores are highly detailed documents which contain all of the necessary instructions to reproduce a consistent rendition. Thin scores on the other hand delegate many of these factors – such as form, texture, instrumentation, and dynamics – to the performer's discretion. This paper will explore Davies' thick-thin model in the context of Bourdieu's notion of habitus as a framework to promote musical autonomy amongst student music therapists, empowering musical flexibility and responsiveness to inform their use of music in clinical settings.

What's the difference? Exploring music activities and music therapy in aged care

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Both music activities and music therapy are typically seen to have a role in addressing aged care needs. Frequently, members of the public experience confusion in understanding the difference between both approaches: music activities and music therapy. This paper seeks to directly explore these differences. Using a cross-case analysis approach, a recent industry-based example of training volunteers in music activities in the aged care unit is contrasted with previous published examples of music therapy aged care practice by the same author. Parameters such as music skills, goal setting, inclusion/exclusion in the group, capacity to address specific health needs, facilitator group skills, and capacity to interact interprofessionally with the team are addressed. A detailed review of the training program required to develop the relevant skills is also included. Findings suggest that both music activities and music therapy have a role in aged care, and the author suggests a clear model for incorporating both approaches in order to benefit the patient/client in the aged care setting.

Musical prescriptions for improving a depressed mood

Sandra Garrido[1], Daniel Bangert[2] and Emery Schubert[2]
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Music has been used for mood regulation purposes for centuries. Pythagoras, for example, is said to have developed specific melodies that could be 'prescribed' to regulate depressed moods and others that could be used to counteract anger (Iamblichus, 1999). While music is instinctively and effectively utilized to improve mood by most people in their everyday life, research demonstrates that people with tendencies towards depression are often attracted to music that may perpetuate a depressed mood. In the current study 176 participants listened to a playlist of 'happy' or 'sad' music over a 4-week period and completed mood diaries. Results suggest that listening to 'prescribed' music is not effective for long-term mood improvement. However, the mood diary system employed in this study was found to be effective in raising participant awareness of the impact of music on mood and for increasing deliberateness of music choice in some participants.

Therapeutic effects of singing on health and wellbeing

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Singing is an accessible, non-invasive, and cost-effective way to improve health and wellbeing. Awareness of the social, psychological, and physical health benefits of singing has increased significantly over the past decade. Singing has been reported to improve mood, decrease stress hormone levels, facilitate social connection, boost immune function and stimulate neuroplasticity. We use different brain networks when we sing than when we speak. So when the language area is damaged, it is sometimes possible to access words through our singing networks. Singing also provides the rhythmic and melodic cues for patients with neurogenic communication disorders to organize their speech production and can therefore be used to improve speech intelligibility and naturalness. Further, singing familiar song lyrics can elicit a priming effect on word retrieval, and rhythmic speech–motor entrainment may assist patients with verbal fluency disorders. In this presentation, Dr Tamplin will share findings from her research into the therapeutic application of singing in dysarthric speech rehabilitation and in addressing respiratory and voice issues for people with quadriplegia. She will also discuss her research with the Stroke a Chord choir for people with aphasia post stroke and her current research with ParkinSong singing groups for people with Parkinson's and their caregivers.

Exploring performance anxiety as a means to facilitate musicians' health

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The need to perform at ones best under high pressure situations may for many musicians, at some point in their learning and performance careers, trigger debilitating music performance anxiety. This is associated with marked emotional distress, impaired performance and performance avoidance, presenting a substantial barrier to learning and occupational health. Yet, our understanding of valid and reliable interventions to reduce music performance anxiety for adolescent and young adult musicians who are training for a performance career is minimal. This paper presents findings from recent surveys of musicians' health and wellbeing, as well as performance psychology skills training programs which translate the psychology of optimum performance in elite sports onto the musicians' training process. By enhancing performers' self-knowledge, combined with the application of anxiety management strategies when under pressure, these studies show that the negative effects of performance anxiety can be reduced. Commensurate with this, performance resilience increases through improved confidence, self-belief, courage, persistence and ability to recover from mistakes. Drawing from these studies, evidence-based strategies are presented to assist musicians to achieve maximum health and wellbeing as they perform under pressure.

SYMPOSIUM & WORKSHOP: Using music therapy techniques for inner change and development: The Bonny Method of Guided Imagery and Music

Alison Short[1], Denise Grocke[2], Meran McKenzie[3] and Louise Terry-Clark[3]
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Focusing on a specialist music therapy technique, the Bonny Method of Guided Imagery and Music (GIM), this symposium explores the capacity of this innovative technique to promote inner change and development. Developed in the 1970s, GIM combines music, relaxation and imagery to actively explore the inner world via a well-developed and documented psychotherapeutic technique. Presenters utilise multiple case examples and formal research projects in diverse applications to demonstrate the way that this method can address psychological, emotional and physical health goals. Case review, multiple case study and qualitative narrative semiotic approaches are applied to data gathered from a total of 102 sessions across three different projects which focus on clients addressing midlife, relationship, and physical health change. Following the case study and research presentations, symposium participants are offered a workshop experience of combining music and imagery in line with GIM principles. The symposium concludes with time allocated for the panel to respond to questions and comments.

GIM as an agent for therapeutic change in health and wellbeing

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This presentation reviews the initiation and development of the Bonny Method of Guided Imagery and Music (GIM), including its further development in Australia via training, research and publications. Foundational principles and techniques are discussed, leading to an outline of the broad range of evidence and applications in clinical practice. This presentation forms an introduction to three Symposium presentations of clinical and research work, followed by an experiential workshop component and panel discussion.

Developing strength and courage after relationship transition: Using GIM for empowerment

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The ending of a relationship creates a challenging time for people, requiring increased inner resources. During this time, clients may search out various supportive therapies, including GIM. This case study describes a series of GIM sessions conducted with a 53 year old female client who was navigating a challenging time at the end of her marriage. Self-reported imagery, artwork and verbal discussion within 22 standard GIM sessions were clearly documented, in addition to standard note taking by the therapist. These materials were

subsequently reviewed, with client input as relevant, in the development of this case presentation. The client actively engaged with the GIM process in an ongoing manner. She described a number of experiences during the relationship which can be identified as domestic violence. The end of the relationship for this client was challenging in a number of areas (making new living arrangements, dealing with grief, loss and anger) and required her to find and develop her inner resources to manage her difficult circumstances (negotiating the separation, dealing with legal processes, maintaining her relationship with her children) Her relationships with family and friends during this time were something that she clearly identified as a priority for her. In reviewing the sessions, this client concluded: 'I found my strength and courage. I visualised myself as strong and courageous. I was able to work through a very difficult time and discover (or uncover) someone who was capable, decisive and empowered to live an authentic life.

Inner change in midlife: Using GIM as a supportive framework to address health and wellbeing

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For many people, the midlife period is a turbulent time of considerable inner change. Typically, people may use a range of strategies to address their individual needs, including psychodynamic therapy. This presentation explores the role of GIM in supporting eight women during their struggles with losses, hopes and their search for direction during the midlife period. It does this via an examination of their reported imagery during their GIM sessions. Case study data from 49 standard GIM sessions conducted over a 10 month period were pooled, analysed and reviewed for commonalities. Emergent themes included: 1) Land of death and Darkness, 2) Betwixt and between, 3) Helpers 4) The body and 5) Looking forward. Examples of relevant music and artwork are presented. It was found that the reported imagery offered clients a symbolic language to access and to integrate aspects of their inner selves, providing a safe journey between the conscious and unconscious worlds. The music also made available a figurative space for the clients to be held and a container where growth and transformation became evident. Evidence from this project suggested that the framework of GIM sessions contributed substantial benefits to the health and wellbeing of women during the midlife period.

Changing perceptions of physical health and wellbeing: GIM in cardiac rehabilitation

Alison Short

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Recovering from cardiothoracic surgery, many people experience depression and an inability to re-engage with life, both physically and emotionally. An exploratory GIM program which focused on how patients may use self-reported imagery in cardiac rehabilitation suggested a

range of psychosocial benefits. This presentation focuses particularly on changed perceptions of physical abilities during the GIM sessions. This research project took place in two major teaching hospitals, with six participants aged 57-72 years and equal numbers of males and females. Participants commenced the study at 6-12 weeks post-operatively. They typically underwent six standard GIM sessions on a weekly basis, with data being audiotaped and subsequently transcribed. The three-stage qualitative analysis process involved: 1) thematic analysis of reported imagery during the music, 2) semiotic analysis using intertextuality (circumtext, intratext, intertext) and 3) placement of the grand themes within a Jungian interpretive community. In this presentation, results of the grand theme, *Rehearsing new steps*, are highlighted, which also links to the Jungian Hero's journey stage of *Returning to the world*. Examples are discussed and reviewed, such as reported imagery of playing golf, walking a giant staircase and riding a bicycle. It is concluded that participants used the GIM sessions to change their perceptions of their own health and wellbeing after cardiothoracic surgery.

What is GIM like? A personal music and imagery exploration

Alison Short[1], Louise Terry-Clark[2,3] and Meran McKenzie[4]
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Facilitated by three qualified GIM practitioners, this experiential workshop engages participants in a group music and imagery activity in order to understand elements of the GIM process. Personal change will be explored via the music and imagery process. Sitting in their chairs, participants will be invited to join in a relaxation process followed by a personally selected image which is in turn supported by carefully selected music. At the end of the music, opportunities will be given for processing evoked material using journal, art and discussion. The session will end with opportunities for further questions and discussion with the panel of GIM professionals.

SYMPOSIUM: Music and emotion regulation across samples and settings

Genevieve Dingle, Joe Hodges, Ashleigh Kunde, Jessica Lewis, Elyse Williams, Jolanda Jetten and Nick Carter
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This symposium includes four empirical studies in which music psychology theories about how music evokes emotional responses have been applied in programs to enhance participants' emotion regulation. The first paper presents pilot data on a group music emotion regulation program *Tuned In* from an at-risk adolescent sample and two mainstream school samples. The second paper explores whether individual factors influence the effectiveness of a new iPhone app, *Music eScape*, designed to help young people regulate their emotions using their own music. The third paper examines how the School of Hard Knocks members experience choir singing or musical group activities as a form of interpersonal emotion regulation. And the final paper presents data from a randomised control trial of *Smoke into Sound*, a new web-based program using personal music to manage emotions and cravings among adults attempting to quit smoking. Taken together, the findings clearly show that programs involving music offer engaging and accessible ways of evoking emotions and promoting emotional awareness and regulation among participants of across age groups and settings.

Tuned In: A group music listening program to enhance emotion regulation

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Tuned In is a group music based program designed to teach young people emotional awareness and regulation skills. The program can be run in various forms and has been piloted with three different samples. Firstly, an at-risk sample of 41 adolescents (76% male, M_{age} = 14.83 years) received *Tuned In* over eight sessions, with each session focusing on a different emotional state**.** Secondly, a half day workshop was offered to 215 adolescent girls attending a mainstream school (M_{age} = 13.6 years). Finally, a five sessions version of *Tuned In* was offered to 72 adolescent girls at a mainstream secondary school (M_{age} = 15.56 years) as part of a randomised control trial. Significant improvements were found from pre-program to post-program for emotional awareness, ability to name emotions, using music to manage emotions, and having a range of healthy emotion regulation strategies. There were trends in the direction of improvement in several subscales of the BASC within the at-risk sample. Within the older mainstream schooling sample, trends in the direction of improvement were also found in symptoms of anxiety and depression (k6), as well as test anxiety. For both the at-risk sample and younger mainstream schooling sample, ratings of enjoyment of the program, whether they would recommend it to others, and whether they would continue to use the strategies to manage their emotions were all rated > 5 (out of 7).

Do individual factors moderate the emotion regulation effectiveness of a new iPhone app *Music eScape*?

Jessica Lewis and Genevieve Dingle
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The Music eScape app was designed by a team at QUT and funded by the Young and Well CRC. This study was part of a larger randomised controlled trial conducted to test the efficacy, outcomes and quality of the beta version of the Music eScape app (Hides et al., 2015). A total of 164 young people with at least mild levels of psychological distress were randomly allocated to one of two conditions: (1) immediate access to the app or (2) delayed access by 1 month. Measurements of affect regulation skills (DERS), mental health symptoms (K10) and wellbeing (MHC-SF and SWL) were made at baseline and 1, 2, 3 and 6 months. All measures improved at all times subsequent to baseline in both conditions. This paper will report on individual factors such as gender, trait emotional sensitivity to music, and state emotional use of music as possible moderators and mediators of response to the *Music eScape* app.

Emotion regulation during community music groups for disadvantaged adults

Elyse Williams, Genevieve Dingle and Jolanda Jetten
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Chronic mental and physical health conditions are often related to difficulties with social isolation and emotion dysregulation. The School of Hard Knocks runs arts groups to facilitate social connections and wellbeing among disadvantaged adults in Brisbane. Enhanced social networks and creative activities are believed to cultivate emotion regulation. This study investigated the impact of music groups on emotion regulation in disadvantaged adults. Participants were members of a choir, musical theatre or basketball percussion group. The effect on mood from participating in the musical groups was also compared to participation in a creative writing group. The PANAS was used to assess mood at four time points: beginning of the day, before group, during group, and end of the day. These results are presented with contextual data on participants' emotion regulation strategies, identification with the group, perceived social support and mental wellbeing. Our results revealed that participation in community music groups for disadvantaged adults improved positive mood during session and had lasting effects on decreasing negative mood throughout the day. These findings provide insight into the psychological mechanisms through which music groups improve mental wellbeing.

Randomised controlled trial of *Smoke Into Sound*: A new web based program using music for smoking cessation

Nicholas Carter and Genevieve Dingle

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This study examines whether music-listening can assist smokers in quitting, by providing crucial emotion-regulatory functions that are missing from existing quit smoking programs. A randomised controlled trial design was used to explore the benefits of emotion regulation via music-listening over and above other smoking cessation treatments. Adult smokers (N = 60) attempting to quit on a best-practice telephone smoking cessation program, delivered by Queensland Quitline, were given access to usual care (telephone counselling), or one of two interactive video websites developed by the authors: one which provided psychoeducation around the use of musical emotion-regulation as a smoking cessation strategy; and a control program which provided basic cognitive-behavioural strategies. Key measures include actual smoking behaviour, the mechanisms by which the two programs are expected to work, i.e. emotion regulation and cognitive behavioural, and also participants' ratings of engagement with the programs.

SYMPOSIUM: What is Music Psychology?

Genevieve Dingle[1], Nikki Rickard[2], Peter Keller[3] and Mary Broughton[1]
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This session aimed at students is designed to introduce music psychology as a discipline and how it fits alongside other sub disciplines of psychology, neuroscience, philosophy, education, and so on. We will explore the range of topics that might be included under the banner of music psychology and give some examples of our own music psychology research and some cases in which music psychology theory has been translated into practice. The workshop will describe current options of how to study Music Psychology in Australia as well as potential career pathways for individuals wanting to pursue music psychology in their work.

Workshop Abstracts

Acceptance and Commitment Therapy (ACT) for musicians

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This 90 minute workshop is designed to give an overview of Acceptance and Commitment Therapy (ACT) approaches that can be used when working with clients working in creative fields, particularly those working in contemporary musical fields. There will also be discussion about the personality traits of Rock Musicians and the internal and external challenges that musicians may experience as well as strengths that they bring to the therapy process. Wayne will draw on his 15 year experience as a psychologist working with creative populations, as well as his prior experience as a recording artist/producer in the 80's and 90's. The workshop would be particularly useful for musicians, teachers and therapists working with creative personalities in particular musicians. The format would be oral presentation assisted by power point and would include experiential exercises of therapeutic techniques that can be used for issues such as performance anxiety. Objectives include: (1) provide an overview of internal and external challenges experienced by musicians working in contemporary fields; (2) to provide an outline of some therapeutic interventions based on ACT techniques to treat presentations common to contemporary musicians and those engaged in creative pursuits; and (3) to give the participants an opportunity to practice some of these techniques in the workshop.

Express Yourself: Combining verbal and non-verbal therapies to engage adolescents with mental health issues

Joanne McIntyre[1], Mary Woodward[2] and Anna Blechinger[3]
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Adolescents with mental health disorders often experience difficulties in social interactions and emotional expression. Different therapeutic disciplines typically use different approaches to attempt to develop these skills, but often work in relative isolation. This workshop will describe a pilot group facilitated by a speech pathologist, a registered music therapist and an art therapy student, drawing on their respective evidence bases, to blend the verbal and non-verbal modalities. The group took place in an in-patient psychiatric unit with adolescents with complex and/or treatment-resistant mental health conditions, and evolved in response to the engagement and different needs of the young people. The presenters will explain the process and content of the group, discussing the contrasting yet complementary facilitation styles of the three therapists and their modalities.
The presenters will examine the successes and challenges of this collaboration over the duration of the programme, and how some of the challenges were overcome. Consideration will also be given to whether the group was as effective as the therapists working in isolation. Workshop participants will be encouraged to engage in some of the activities utilised in the group sessions including a drama exercise, a drum circle and an art activity. These examples will illustrate how the group leaders

developed verbal expression and communication from the non-verbal foundations offered in each session. It will also assist workshop participants in considering how different modalities can work together to meet a shared goal, and to experience what this approach might be like for a therapy group member.

Oral Presentation Abstracts
(alphabetical order according - first author)

How far can mouth adjustments go in wind instrument playing?

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Many advanced techniques in the performance of reed instruments require a correct mastering of the resonance properties of the vocal cavity. Suitable configurations of mouth, tongue and throat allow for the production of altissimo notes, pitch bends, glissandi, and control of timbre, also favouring a quick attack in certain notes. Acoustically, the reed is loaded by the acoustic impedance of the bore of the instrument on one side and that of the vocal tract on the other and a simple model indicates that the two act in series. Studies in this lab have shown that, to achieve some of the advanced effects mentioned above, players generate peaks in the vocal tract impedance whose magnitude is comparable with those of the bore, and tune the tract resonances. For techniques such as altissimo playing and pitch bending, players also vary other embouchure parameters that are difficult to measure simultaneously during playing. To understand these phenomena in detail, and to control mouth resonance properties and other control parameters such as blowing pressure and lip force independently, we have developed a clarinet playing machine. To vary the acoustic impedance at the playing frequency in the artificial mouth, we use an electronic feedback technique. Measurements quantify some effects of vocal tract impedance alone, including: Varying the phase of the vocal tract impedance changes the playing frequency, and changing the tract impedance at the frequency of the third harmonic changes the harmonic ratio in the output sound.

Visual search: Musicianship, expertise and non-musical targets

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In the 1990s enormous interest – scientific and commercial – was generated following the publication of an article in 'Nature'. The authors claimed that their subjects' performance improved on spatial reasoning tasks after listening to a Mozart piano sonata when compared with those who listened to a relaxation tape or to nothing at all (Rauscher 1993, Rauscher 1998). Known as the 'Mozart Effect', the premise that 'music makes you smarter' no longer holds much sway in the scientific community (Chabris 1999, Hetland 2000, Pietschnig, Voracek et al. 2010). However, researchers have continued to investigate whether or not musicians are superior to non-musicians musicians in other neurological capacities such as efficiency in eye movements (Kopiez 2002), working memory (Meinz 2010) and brain structures generally (Gaser and Schlaug 2003, Patston 2007). It might be expected that musicians would be faster and more accurate than non-musicians at detecting a specific musical target from among a group of similar distractor musical targets – a visual

search task involving matching groups of musical notes. But, do they have superior pattern recognition skills for searching non-musical targets?

The current project investigated the visual search capabilities of musicians/non-musicians and expert/non-expert music sight-readers for non-musical and music-like targets. Auditory preparatory tones were also tested to look for priming or interference effects for the music-like targets.

Significance was achieved in visual search tasks with respect to accuracy for musicians over non-musicians using non-musical targets: $p = 0.01$. Expert music sight readers performed significantly better than non-experts in a music-like target search when the preparatory tones corresponded with the visual stimulus: $p = 0.003$.

These results suggest that musicians possess broader visual spans and/or experience less peripheral target crowding effects and that expert sight readers are able to access other sensory information to enhance performance.

Group singing enhances positive affect in persons with Parkinson's Disease

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Aim and Background: Group singing has been shown to have beneficial effects on mood in both healthy and patient populations. The mechanism underlying this is unclear but it has been attributed to social aspects. We aimed to explore the immediate emotional effects of group singing in persons with Parkinson's Disease (PD) following participation in a weekly choir session. We hypothesised that singing would have positive emotional effects.

Methods: 11 participants with PD who sang in a weekly choir group completed a measure of current emotional state, the Positive Affect Negative Affect Scale (PANAS), in three conditions: (1) immediately after singing familiar songs; (2) immediately after singing unfamiliar songs; and (3) prior to choir participation (no-singing condition). We compared PANAS results in each condition using the Wilcoxon Signed Rank Test.

Results: Positive affect scores were significantly higher immediately after singing compared with the no-singing condition ($p = .003$). There were no differences in affect scores between singing familiar and unfamiliar songs.

Conclusions: This is the first study to investigate the immediate emotional effects of singing in a PD population. We found that group singing had immediate emotional benefits in the form of enhanced positive affect for people with PD. This supports previous findings of the therapeutic effects of group singing.

Learning a new song in the context of severe Alzheimer's Dementia

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Aim and Background: The hallmark symptom of Alzheimer's Dementia (AD) is impaired memory. Memory for familiar music, however, can be preserved, even in severe cases. We aimed to explore whether a non-musician with severe AD could learn a new song.

Methods: Norma, a 91 year old woman with severe AD and a love of singing but no formal music training, was taught a Norwegian tune (without lyrics, sung to 'la') over 3 sessions. We examined (1) immediate learning and recall, (2) 24 hour recall and re-learning and (3) 2 week delayed recall. She also completed assessments of cognition (ACE-III), pitch and rhythm perception (selected from MBEA subtests), and famous melody recognition. A purposefully developed two word recall task (within song lyrics, a proverb or as a word stem completion task) was also completed.

Results: She showed impaired cognition across all domains with severely impaired verbal recall memory (0/3 words after 3 minute delay). Her pitch and rhythm perception was intact and she could identify familiar music. She recalled 0/2 words presented in song lyrics or proverbs, but completed both words when provided with the word stem, suggesting intact implicit memory function. She could sing along to the newly learnt song on immediate and delayed recall (both 24 hours and 2 weeks later), and with prompting could sing it alone.

Conclusion: This is the first study to demonstrate preserved ability to learn a new song in severe AD. Possible mechanisms underlying this are intact implicit memory and increased emotional arousal during singing.

Synchronisation and interpersonal affiliation in the silent disco

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Dance is a fundamentally social activity. Studies have begun to examine the role of movement in music for conveying emotions, while some finger tapping studies have found that synchronisation increases interpersonal affiliation. However, music and movement studies have focused on individuals and comparatively few studies have involved participants in a joint setting. The aim of the proposed research is to examine the importance of synchronisation in a dance setting for building interpersonal affiliation.

This is tested using a Silent Disco scenario, in which participants hear the music in slightly different timing to each other. Participants are drawn from the population of a Finnish university, and measured on personality traits such as trait empathy (Empathy Quotient) and the Big Five. One participant will hear the original track, while their partner hears it either: unchanged (the synchronised condition), time-shifted by a quarter beat, time-shifted by half a beat, and/or with a

slightly stretched tempo. A behavioural measurement of interpersonal affiliation is used, measuring the distance that participants sit from each other during debriefing after the study.

It is hypothesised that pairs in the synchronised condition will experience greater interpersonal affiliation at the conclusion of the study than those in one of the unsynchronised conditions. Further analysis may examine the role of personality traits in the response of participants to the task.

This presentation will discuss preliminary results. The proposed research should provide new insights into the role of synchronisation in social dancing. If the hypothesis is supported, it may suggest that shared experiences create a greater sense of affiliation when shared in time.

Musicianship and vocal emotion recognition: Explorations in individuals with congenital amusia

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Pitch deficits in individuals with congenital amusia have been linked with difficulties in processing emotion via speech prosody. However, it remains unclear whether this finding extends to other pitch related domains, such as nonverbal vocalisations (e.g. laughter), or to social evaluations such as facial expressions. The present study investigated the link between sensitivity to music and emotion recognition abilities by examining emotion recognition in speech prosody, nonverbal vocalisations, and dynamic facial expressions. We also examined evaluations of emotional authenticity in laughter. Thirteen amusic individuals and 11 matched controls judged 7 emotions (amusement, anger, disgust, fear, sensual pleasure, relief and sadness) across three modalities (speech prosody, nonverbal vocalisations and facial expressions). They also gave authenticity and contagion ratings to 24 voluntary (posed) and 24 spontaneous laughs. Overall, amusics had lower emotion recognition accuracy (M = 63.2%) than controls (M = 74.3%), $F[1,22] = 12.23$, $p = .002$, an effect similar across modalities. Amusic individuals also demonstrated abnormal emotion processing by giving more ambivalent responses (M = 14.9%) than controls (M = 6.6%), $F[1,22] = 11.85$, $p = .002$. For authenticity ratings, the perceived distinction between voluntary and spontaneous laughs was significantly smaller in amusics than in controls ($F[1,18] = 16.422$, $p = .001$); for contagion, though, the difference between amusics and controls was not significant. The findings point to a supra-modal impairment in the processing of emotion in amusia - extending beyond the auditory domain – and indicate a common pathway in the development of musical and emotional capacities.

The effect of melodic intonation therapy on tongue twister-induced speech disfluency

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Melodic intonation therapy (MIT) is an effective treatment for certain individuals with non-fluent aphasia, but questions remain as to why it enhances fluency following neurological impairment, and whether it can assist with fluency problems among neurologically intact individuals. In this study, we examined the effect of MIT and its therapeutic components (melody and rhythm) on speech disfluency in neurologically intact individuals. Speech disfluency was induced using 10 tongue twisters created for the study. Seventy-one participants were randomly assigned to one of four treatment conditions: control (repetition), full MIT (intoning and left-hand tapping), melody (intoning) or rhythm (left-hand tapping). Each condition involved a pre- and post-treatment fluency assessment phase, and a training phase in which treatment was applied to the articulation of the tongue twisters. Post-treatment disfluency scores on the trained tongue twisters were similar for rhythm (M = 28.2), melody (M =28.1), and control (M = 25.1), but significantly reduced for MIT (M = 14.2), t(67) = -3.37, p = .001. Although an analyses of difference scores revealed unreliable main effects, an analysis of individual error-types revealed that MIT led to a significant improvement in fluency for a range of error types (e.g., repetitions and vowel errors). These results suggest that MIT can help to reduce disfluency for certain types of speech errors, but not others. We argue that the use of tongue twisters to induce transient disfluency in neurologically intact individuals is a valuable strategy for evaluating treatments for disfluency following neurological impairment.

Investigating cognitive and affective empathic responses to contemporary western solo piano performance

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Audience members' effective engagement with music performing arts involves cognitive and affective elements. Musical and specific motor expertise, and modality of presentation may shape cognitive, but perhaps not affective responses to music performance. In an empathy framework, this study investigates cognitive and affective responses to contemporary solo piano performance according to participants' musical and motor expertise, and modality of presentation (audio-only vs. audio-visual).

Empathy includes experience sharing (*affective empathy*) and mentalising (*cognitive empathy*) elements. Underpinning affective empathy is the capacity to feel and share emotions, which are basic attributes of normal-functioning humans. Cognitive empathy is conceptualised as being able to take the perspective of another person, and may be expertise moderated. Understanding is argued to result from the cognitive empathic ability to 'put oneself in another's shoes'.

Non-musicians, musician non-pianists, and musician pianists participated in an experimental study. Cognitive empathic responses (*understanding* – asking participants to 'put themselves in the performer's shoes' and report their understanding of what the performer was doing to physically generate the expressive performance) were continuously self-reported on a one-dimensional scale. Affective empathic responses (subjective affective experience) were made on two-dimensions (arousal and valence) simultaneously and continuously. Liking and familiarity ratings were gathered following each excerpt on seven-point Likert scales.

As hypothesised, musician non-pianists and pianists reported significantly higher understanding ratings than non-musicians. Contrary to expectation, the two musician groups did not significantly differ in their understanding responses. As predicted, audio-visual presentations received significantly higher understanding and liking ratings than audio-only. As hypothesised, musician non-pianists and pianists reported significantly higher liking responses than did non-musicians. As hypothesised, no significant arousal, valence, or familiarity effects were observed.

While affective empathic responses appear similar across expertise groups and modality of presentation, cognitive empathic responses vary according to musical, but not piano-playing motor expertise, and modality of presentation. However, results should be considered in light of potential sample size and cognitive empathy measure issues. Multimodal educational strategies designed to enhance understanding of how musicians physically generate expressive performance may assist in developing non-musician audiences for contemporary music performance.

Spatial responsiveness – Allowing an acoustic environment to direct spontaneous musical composition

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While there exists research on electroacoustic and spatial music specifically composed for an environment, very little is written on the more improvisational aspect of performing an acoustic instrument in a particular space, and letting the space inform the musical direction and content. A solo piano recording project was undertaken at the Auckland Town Hall Concert Chamber with this concept as its focus. This paper documents the musical and cognitive processes involved in responding to the particular environment, and provides technical analyses of both the recording and room acoustics to determine possible correlations.

Dissonance in studio lesson interactions

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In recent years researchers have contributed a great deal to our shared understanding of the complexities of studio-based learning, which is widely regarded as central to higher education music (Carey 2013; Gaunt 2008; Presland 2005). On the whole, the studio system has been found to be

effective, by students (Burwell & Shipton 2011, 267; Gaunt 2009, 185; Presland 2005, 239) and by professional bodies (Music Council of Australia 2011; Association of European Conservatoires 2007). To date, however, the research literature has offered little concrete information about studio practices that students have regarded as ineffective. This paper investigates the cases of two students who, exceptionally, report dissatisfaction with the approaches taken by their current teachers. The cases are explored through the "rich transcription" of observation evidence, including a close description of verbal, nonverbal and performance behaviour in studio lessons, cross-referenced with interview evidence with the teachers and students involved. Issues including the affective aspects of learning, student independence, and the development of critical thinking, are loosely grouped under the metaphor of dissonance, giving rise to questions that might be applied, arguably, in any studio setting.

Working memory and auditory imagery predict sensorimotor synchronization with expressively timed music

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Sensorimotor synchronization (SMS) is especially prevalent—and therefore readily studied—in musical settings, as most people are able to perceive a musical beat and synchronize with it (e.g. by finger tapping). SMS processes have been tested extensively using pseudo-musical pacing signals, but we extended this by using naturalistic, expressively timed piano music, characterized by slight tempo fluctuations for artistic interpretation. As people vary greatly in their SMS abilities, and given the dynamic nature and variability of SMS, we hypothesized that individual differences in working memory and auditory imagery—both fluid, cognitive processes—would predict SMS at two levels: 1) asynchrony (a measure of synchronization error), and 2) anticipatory timing (i.e. predicting, rather than reacting to beat onsets). In Experiment 1, nonmusicians and separately recruited musicians completed two working memory tests, and four auditory imagery tasks. They were then tested in a SMS-tapping task. In Experiment 2, nonmusicians completed an expressive timing perception test to examine which cognitive variables predicted perception without action. Hierarchical regression models were used to assess the contribution of the cognitive variables to SMS. Results showed dissociations among imagery types as they relate to asynchrony and perception, and suggest a role for working memory in anticipatory timing. Musicians performed better on the SMS task, but showed fewer correlations between the cognitive variables and SMS. These results suggest that in nonmusicians, imagery for pitches and temporal patterns is important for synchronizing to an auditory stimulus, but working memory is implicated in strategically synchronizing via anticipation of beat onsets.

Engaging and motivating students of music: Applying the Model of Elite Practice, Phase 1

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Finding ways of motivating student engagement and learning is an on-going challenge that, in recent years, has become a particular focus in higher education. One area of learning - the domain of music performance, highlights the importance of this stimulation. Solitary practice remains one of the key skills to be acquired and mastered for students to become elite performers. The unique insular nature of practice requires motivational strategies and strengths, which have become a focus for some music psychology research. A Model of Elite Practice (MEP) has resulted. Describing the efficient practice strategies used by elite musicians as 'unfolding systematically', the MEP plots: problem solving through cognitive paths; actions (key strategies) and the application of skills (tools). Powerful motivational strategies (switch attitude, positive thinking, confidence, persistence) emerged as dominant devices beside more anticipated 'traditional' practical strategies (repetition, score marking, simplification). This study aimed to test the MEP as a transferable tool, to activate engagement, stimulate intrinsic motivation and provide music students with ongoing independent practice resources. Over one semester, eight workshop/interventions (within a peer-learning environment) were offered to five volunteer performance students at the Sydney Conservatorium of Music. Data collection included: 1) video/audio recorded pre and post-study music practice test; 2) think aloud and interview following tests; 3) participant self-report diaries; 4) thematically coded workshop/interventions. Findings confirmed the MEP was successfully transferred into all participants' practice as positive changes in motivational language (workshops, think alouds, interview), increased time spent practicing (workshop and diary reports) and measured behavioural changes between pre and post-study music practice test data.

Expressive accent in live music performance: Is perceptual accenting accuracy influenced by instrument of specialization?

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Expressive accent occupies a central place in musical artistry with performer extra-textual expressive contributions strongly implicated within processes of emotional communication. The majority of music performance takes place in groups therefore performative expression is executed and responded to mainly in ensemble rather than solo settings. Examining for difference in Auditory-Biography, i.e. personal listening history, and how this difference might impact individual auditory acuity and group performance outcomes, has received little attention. This study investigated musicians' perceptions of accenting patterns during live performance and asked whether Auditory-Biography aspects of timbral familiarity/register/instrument of specialization would influence perceptual accuracy. Forty tertiary performance students listened to a J.S. Bach Sonata excerpt performed using widely varied accenting characters. Performance instruments were Bassoon, Tin

Whistle, and Flute. Listeners were asked to mark beat onsets which were highlighted in some way. Data were pre-processed using Signal Detection Theory, analysed with general linear models using inference via Bayes factors. General linear models included factorial ANOVA-equivalents and univariate simple effects analyses. Results indicated correlations between perceptual accuracy, timbral familiarity/unfamiliarity and instrument of specialisation. A low-voice superiority effect was evident in bass specialist results when listening to the lower-voice performance instrument of Bassoon. Altered auditory processing appeared to have been triggered resulting in prioritised processing of rhythmic/beat aspects as opposed to melody line. Trial outcomes suggest enhanced Auditory-Biography development through targeted/explicit ensemble experiences and instrumental repertoire choices during training.

Interactions without violations: Further proof that music and language draw on shared syntactic processing resources

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Mounting evidence suggests that the simultaneous processing of music and language syntax draws upon a limited pool of shared syntactic processing resources, leading to interaction effects. Until now, such interaction effects have only been found when syntactic violations are present in the music (out-of-key chord/note), the language (grammatical violation), or both. The current experiment tested whether such interaction effects could be elicited in the absence of syntactic violations – in normally structured music and language. Participants listened to different types of music stimuli while reading either a complex sentence or word-list, and were then asked to recall the language stimuli. Syntactic interaction effects were found without syntactic violations, as evidenced by higher error rates in sentence recall when paired with normal melodies compared to environmental sounds. There was no significant difference in error scores for the normal and environmental conditions in word-lists, suggesting a syntactic interaction effect. An interesting finding in the present study was that melodies with randomly alternating timbre changes lead to fewer errors in sentence recall. One explanation for this is that the constantly changing instruments captured attention and increased the need for perceptual streaming, leaving less attention for processing the melodic syntax. This in turn may have freed up resources for processing the linguistic syntax, and suggests that syntactic interaction effects may be modulated by attention. The current experiment provides evidence that syntactic interaction can occur even without the presence of violations, giving strong support to theories of shared syntactic processing between music and language.

Distinguishing between immediate emotional response and long-term mood impact of music listening: Issues in study design

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Being able to draw firm conclusions about the long-term effects of musical engagement on mood and mental health is of great importance given the increasing number of music and other arts programs found in health contexts and the need to provide solid evidence of their benefits to policy makers. However, researchers face the methodological difficulty of distinguishing between the immediate emotional response of participants to music and long-term effects on their mood in their studies. This paper presents a systematic review of studies measuring emotional and mood impacts of music, and the results of an empirical study which further demonstrates the importance of the consistent use of specific criteria for distinguishing mood and emotion. Specific criteria for future study designs are proposed.

Mental imagery of musical pitch: A MEG study with a validated musical imagery task

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The brain mechanisms underlying musical imagery, our ability to mentally replay or create music, remain relatively unexplored, partly because of deficiencies in existing experimental paradigms. To address these deficiencies, the Pitch Imagery Arrow Task (PIAT; Gelding, Thompson, Johnson, PLOS ONE, 2015, 10(3)) was designed to reliably induce pitch imagery in individuals with a range of musical training. The PIAT requires individuals to use visually displayed arrows to guide imagery of a scale-step sequence of pitches. Imagery is verified by indicating whether the final imagined pitch matches an audible probe. The present study investigated the neural mechanisms of pitch imagery during performance of the PIAT.

Magnetoencephalographic (MEG) measures of brain activity were obtained from 19 healthy adults whilst they completed an adapted version of the PIAT. Musical expertise of the participants ranged from novice to professional musicians. Three conditions (Pitch Imagery, Pitch Perception and Mental Arithmetic) were presented for 80 trials each. Participants performed the pitch imagery trials with a mean accuracy of 80.2% (SD = 14.9%).

Dipole source estimates revealed significant differences in temporal, parietal and frontal brain activation for all conditions. The imagery trials elicited significantly greater activation than perception or mental arithmetic trials in temporal areas during the silent pause prior to the audible probe, when the final imagined pitch was being held in memory (maintenance period). Further analysis is currently being completed to determine the differing brain oscillations across conditions during the last 3 arrow presentations per trial and the maintenance period.

Interference in memory for melody

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Recognition of previously encountered stimuli is a vital interaction between our perception and our memory. While recognition is important for our day-to-day life, it is prone to strong interference effects. Specifically, the number of intervening items between the first and second occurrence of a stimulus interferes with recognition performance in a range of modalities. Although applicable to most memory domains, this phenomenon is not universal. This project investigates how the number of intervening melodies influences recognition performance in memory for melodies. It was hypothesized that, as in other memory systems, recognition performance decreases with every intervening melody. Results of multiple experiments refute this hypothesis. Explicit and implicit measurements, different corpora of music, as well as transposed and non-transposed melodies all lead to the same conclusion: The number of intervening melodies does not interfere with memory for melody. Performance dropped significantly between immediate repetition and one intervening melody. However, every additional intervening melody did not lead to observable performance decreases. It is likely that instead specific features within the melody play a significant role in memory for melodies. Overall, the results advance our understanding of memory mechanics in general and memory for melodies in particular, with implications for a scientifically informed approach to the composition of memorable melodies.

The 'singing approach' to brass playing revisited: We sing the language we speak

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Pedagogues have long relied on using speech syllables to teach students the articulatory movements involved in brass playing. Although Tarr and Dickey (2007) provide precise linguistic descriptions of the different consonants utilized in early wind instrument methods by authors with different native languages, such an account is at present lacking for the vowel sounds recommended to be used for producing notes in different registers. Furthermore, x-ray studies from the 1950s and 60s, and more recent research using ultrasound imaging of the tongue, have shown that most players do not employ as wide a range of vowel positions as prescribed in the pedagogic literature.

This paper looks at the vowel sounds used in method books from 1585 up to the present and categorizes them according to the (likely) pronunciation in the author's native language. Potential misrepresentations will be discussed along with possible acoustic consequences of using different tongue positions during trombone playing.

Finally, the collected recommendations will be compared with empirical findings from ongoing Ph.D. research on the influence of native language on trombone playing, which suggests that most vowel

tongue positions recommended in the literature are only used by small populations of players, if at all. This could be due to incorrect orthographic representation.

Learning in professional orchestras: Emplacement of orchestral performance knowledge

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How do orchestral musicians learn as they engage in their work together? Social and psychologically informed research demonstrates that orchestral work comprises highly collaborative and performance-oriented activities. It involves more challenges than just technical mastery, including the negotiation of interconnected aspects such as social interaction, coping with physiological and mental challenges, and engaging in orchestral cultural practices and workplace-specific organisational practices.

A study was conducting using a sensory ethnographic method to explore the practices of novice professional orchestral musicians. It investigated how their interactions, their processes of sense-making, and construal of the world and self through the senses, contribute to learning processes as part of the demands of everyday orchestral performance. The study incorporates data on physical and psychological engagement with hearing, sight, tactile sensation, spatial awareness and bodily movement through space. Early findings suggest that emplacement is as important a concept as embodiment for understanding how the musicians construct performance knowledge, that is, individual musicians' continuously change their understanding of performance with the demands of unique physical, social and musical situations. The longer-term development of those unique, emplaced knowledges is an important issue for novice orchestral practitioners and the educational institutions they attend.

What are the benefits of musical participation?: Creating a comprehensive measure

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There has been a recent surge of interest in the impact of music on well-being. Existing qualitative studies have begun to outline benefits of music participation, yet these studies are limited by small samples and narrowed focus. Moreover, research that considers both vocal and instrumental ensembles is scant. As a part of a major nationally-funded project that explores musical investment, the aim of this work was to (a) develop a measure of music participation benefits that examines individual differences and (b) examine its structure, reliability, and generalizability across samples.

Following a comprehensive literature review that identified the reported participant benefits of music participation from both quantitative and qualitative investigations concerning separate

studies of vocal and instrumental music participation, subsequent systematic approaches were made to reduce the number of items. These included removing redundant items, eliminating items that were too difficult to answer or were unclear, and using inter-rater reliability measures. Pilot studies were conducted to finalize the set of remaining items for the final measure. These finalized results (under analysis) include a principal component analyses that investigates the structure of participation benefits as well as information regarding the reliability and generalizability of the measure.

The result of this work enables us to introduce a new self-report instrument, which measures individual differences in music participation benefits. While likely to extend previous findings, this new measure overcomes limitations of previous research. It is hoped that this measure, as a comprehensive self-report tool, can be useful for researchers investigating music participation and well-being.

Playlists and time perspective

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Research on playlists has focused on how usage is related to technological and music industry variables, and the demographic characteristics of users. However, it seems reasonable to suspect a psychological component to playlist usage also. The present research considered an individual's propensity to devise and make use of playlists in terms of time perspective. Time perspective refers to the extent to which an individual is concerned with the present moment and also with the future. As an awareness that thoughts and behaviours in the present can have implications for future well-being, time perspective has been shown to affect a person's decisions and actions in several domains. Specifically, this study concerned whether time perspective related to an individual's (a) tendency to listen to playlists and/or (b) the tendency to make different types of playlists. Significant results indicate an emphasis on the time at hand while listening, so that playlist use has a present-orientated time perspective, rather than a future-oriented time perspective. The findings support other recent research illustrating that exercising control over everyday listening is an important aspect of musical behaviour in present-day music listening.

Energy and emotion in music: A corpus analysis

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Previous research investigating emotions, has often used the circumplex model, which posits that emotions can be understood in terms of two dimensions: valence and arousal. While numerous studies have supported this, the research has employed small sample of music. In contrast, the present research 143,353 pieces of music to test whether the energy and beats per minute of music (as proxies for arousal) and popularity as expressed by sales charts (as a proxy for pleasantness) can

predict scores on six moods. Findings concerning energy were clearly consistent with the circumplex model; findings for beats per minute were consistent though more equivocal; and findings concerning popularity yielded only limited support. A second set of analyses considered variations between genres on each of the six moods, finding that there were also numerous relationships between popularity and mood, indicative of the commercial market for music in specific genres; and there was evidence of considerable differences in the mood scores between genres. In addition to the circumplex model and aesthetic responses to music, these results also have implications for music marketing, therapy, and everyday listening.

Identity and musical pedagogy, practice, and performance

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Musical identities mediate musical development (Hargreaves, Macdonald, & Miell, 2012). This premise reflects the traction identity studies have gained in recent years, and forms the basis for the current study. This research seeks to unravel how identity can influence student behaviour in the practice room, with teachers, and on the stage. Through interviews and IPA analysis, the self-perceptions of 12 tertiary students from the Sydney Conservatorium of Music are examined during the process of preparing, delivering, and evaluating a performance. Identity is approached from the social-cognitive perspective, conceptualised as a broad framework built of pieces of information relevant to the self, gathered through experience and social interactions and designed to aid in interpreting information, solving problems, and making decisions (Berzonsky, 2011). Individual differences are explored and acknowledged, based on the view that it is not so much experience which shapes behaviour as personal perceptions and interpretations of experience (Hallam, 2002). Results show that an individual may incorporate diverse elements into identity during their engagement with music, such as technical skills, performance skills, learning ability, relationships with teachers and peers, belonging to musical groups, and perceived chances of success as a musician. Furthermore, relationships are apparent between identity and factors such as feedback management, self-regulation, motivation, and anxiety. Implications for learning, teaching, and performing at a tertiary level and beyond are discussed.

Cortical plasticity for own and partner material after short-term duet training

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The mismatch negativity is an event related EEG/MEG component that occurs automatically around 100 – 250 ms after tone onset when an auditory stimulus is different in pitch, loudness, timbre or tempo. We demonstrated in two earlier MEG experiments with musically untrained subjects that the

MMN component after a melodic and a rhythmic deviation increases significantly after a short-term musical training. An MMN increase was not observed when subjects listened to the same musical exercise and had to give feedback whenever they heard a wrong tone. These results indicated that sensorimotor musical training, but not listening, leads to significant better predictions about upcoming musical events. In the current experiment we tested subjects that learned to play a musical duet. Listening to the partner's musical material in a musical duet has a stronger significance since listening to the partner's part is crucial to achieve a satisfying performance. We trained non-musician subjects in a piano duet situation and measured the mismatch response to the pianists' own and to the partner material before and after training. ERP results revealed that the MMN component increased significantly for pianists' own and for the partner's material suggesting a neural representation of the partner's part in a duet situation. A subsequent source analysis using a beamformer approach revealed a pronounced involvement of precuneus and medial frontal areas presumably for the distinction of own and partner's musical material.

Facilitating wellbeing: Impact of music therapists' practice on clients

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Registered Music Therapists (RMTs) in Australia work with people who have various needs, using elements of music and music-related activities to achieve specific therapeutic goals. In the past, these goals were often measured in terms of physical and psychosocial outcomes in a clinical setting. More latterly, music researchers in music therapy and related fields have expanded their view of the therapeutic use of music on clients' general wellbeing (Ansdell, 2014; MacDonald, Kreutz, & Mitchell, 2012) In relation to this recent view, the current study was developed to understand the motivational and skills investment that RMTs bring to their work when focused on wellbeing outcomes across various client populations.

Three focus group discussions were conducted with groups of RMTs, working with (a) children with various needs, (b) adults with disabilities, and (c) adolescents/adults with mental health issues in a range of settings. A thematic analysis showed that RMTs first invest their musical skills in creating a nurturing environment for their clients. Within the safe and creative environment, RMTs then invest their therapeutic skills in establishing an interpersonal relationship with clients, which has the power to promote client wellbeing. In addition, experiencing joyful and rewarding emotions while witnessing the wellbeing benefits on the clients throughout the course of therapy constantly motivate RMTs to invest more in music making activities and refine/improve their skills as a therapist. As they are actively involved in the therapeutic relationships, RMTs themselves also reported experiencing wellbeing benefits from their practice.

Implicit learning of a novel musical scale: Short- and long-term effect of exposure

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This study examined the implicit learning of a microtonal scale through short exposure. Learning a musical scale involved acquiring information about its pitch intervals and their arrangement in the scale. A novel experimental paradigm was introduced using a timbre discrimination task, with participants required to detect a timbre change in one of the notes in a melody (the target), while the note before the change (the prime) was either from the same or a different scale from the melody. When the prime was from a different scale, it would create two incongruent pitch intervals with the notes before and after it. We assumed that if participants were able to perceive those incongruent intervals, they would respond faster to the target, as a timbre change was more likely to follow those incongruent intervals from the way we arranged the stimuli.

The experiment consisted of two sessions that were spaced one week apart. There was an exposure phase and two test phases, with melodies generated from the C major scale (Control) or a microtonal scale. As predicted, results from 21 non-musicians showed that reaction time in responding to the timbre change was significantly shorter when targets were preceded by the incongruent intervals, for both the Control and Microtonal melodies in the first session. However, this difference was only significant for the Control melodies in the second test phase a week later, suggesting that memory for the newly learned microtonal scale might have faded and perhaps more exposure was necessary for long-term retrieval.

The beginning, the middle and the end … of a well-played note

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To play a reed instrument well, players control pitch, loudness, timbre and articulation (transient behaviour). But which control parameters do they use to achieve this, and how do they coordinate their actions? In the 'ecological' phase of this project, we measured the acoustical impedance of the vocal tract, the blowing pressure and its time variation, the tongue-reed contact and their coordination while players played notes of different pitch, loudness, timbre and articulation. In a complementary phase, we varied the control parameters one at a time using a clarinet playing machine. Experienced players can vary the sound spectrum at constant pitch and loudness by changing the acoustic properties of their vocal tracts. Harmonics of the radiated sound that fall near peaks in the tract impedance are enhanced when the magnitude of a vocal tract impedance peak is adjusted to be comparable with that of the instrument bore. To control initial transients, players vary blowing pressure (P) over time and coordinate this with the tongue release from the reed to achieve different articulations having different rates of initial exponential increase in amplitude. Studies using the playing machine show that frequency, sound level and the spectrum can be controlled by P and lip force applied to the reed. Quiet notes can be initiated by tonguing in the

hysteresis region, where notes cannot start by increasing P only. A fast tongue release from the reed and/or a large initial tongue force produces a substantial discontinuity in air flow and thus a strong transient.

Melodic contour training and its effect on speech in noise, consonant discrimination, and prosody perception for cochlear implant recipients

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Cochlear implant (CI) recipients generally have good perception of speech in quiet environments, but difficulty perceiving speech in noisy conditions, reduced sensitivity to speech prosody, and difficulty perceiving and appreciating music. Advances in our understanding of neuroplasticity and learning capacity have led to interest in formal auditory training as a component of comprehensive (re)habilitation. Two take-home, PC-based melodic contour training programs were developed to evaluate their efficacy in improving speech perception abilities for CI recipients. The melodic contours were simple 5-note sequences formed into 9 contour patterns, such as "rising" and "flat-falling". The programs were adaptive (one-up, one-down) and differentiated by changes introduced in the stimuli: (i) Interval: the interval size (in semitones) was adjusted with note duration fixed—emphasising pitch; and (ii) Duration: the note durations were adjusted with interval size fixed—emphasising speed of processing. Sixteen adult CI recipients (aged 26–86 years) were randomly assigned a training program, and were tested on a speech perception battery at baseline and after 6 weeks of melodic contour training. Twelve NH adult listeners (aged 21–42 years) provided broad comparisons across the test battery. Results indicated benefits for speech perception tasks for CI recipients after melodic contour training, with specific improvement for stop consonant discrimination in quiet $F(1,14)=6.00$, $p=0.028$, and prosody perception $F(1,14)=9.31$, $p=0.009$. In comparison, NH listeners performed at ceiling for these tasks. Despite previous studies indicating improvements for speech-in-noise after melodic contour training, our study found no significant gains. Additionally, there was no significant difference between the two melodic contour training programs, indicating that both conferred benefits.

The influence of perceived agency on interpersonal rhythmic coordination: Drumming with a human partner vs a computer partner

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Successful interpersonal rhythmic coordination requires individuals to anticipate and adapt to their partner's movement timing. Knowledge that the synchronisation partner is an active intentional agent may influence the degree to which individuals engage in temporal anticipation and adaptation. During a series of drumming tasks, the present study simulated a social context by using a virtual partner (an adaptive pacing sequence that mimics human adaptive processes), to

manipulate whether participants believed that they were synchronising with a person or with a computer driven pacing sequence. The degree of virtual partner adaptivity was set to be either less adaptive or more adaptive. In addition, participants rated if they found it easier to synchronise with the computer or the human partner. As expected, participants engaged in less prediction and less error correction when the pacing sequence was more adaptive. In addition, synchronisation accuracy was improved when the virtual partner was more adaptive but only when participants were synchronising with the partner they rated as easier to synchronise with. These results indicate that individuals modulate their performance based on their partner's adaptive ability. Furthermore, beliefs about the perceived agency of a synchronisation partner may influence synchronisation performance, however this is modulated by an individual's impression of which partner is easier to synchronise with.

Algorithmic generation of continua of rhythms

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We present a novel computational algorithm designed to generate, and morph between, a wide variety of rhythms. Various features of rhythmic patterns such as their evenness, well-formedness, and entropy over event durations, can be smoothly transitioned between. The algorithm has both musical and perceptual implications, notably with respect to the performance and perception of rhythmic complexity versus simplicity, and the performance and perception of rhythmic change.

In relation to the perceptual and performative implications, preliminary experimental data has been obtained from circa 80 musically untrained participants, which explores their tapping responses to, and liking ratings for, a variety of the algorithmically generated rhythms. Participants were also able to smoothly control, and choose their preferred, beat-size ratios in complex well-formed rhythms. The data will be modelled with high-level features derived from both rhythm and pitch-based scale theory.

In relation to the musical implications, we will explain the underlying theory of the algorithm, which is based upon successive levels of well-formed words, and non-well-formed variations thereof. These levels make a hierarchy of rhythms where each higher level is a superset of all lower levels, and hence provides an analog of the hierarchical structure of beats and pulses in real-world music. We will demonstrate some interesting types of rhythmic change and transition that can be generated, and note some interesting rhythms, which are deeply non-isochronous in that no higher-level rhythm approaches isochrony. Interestingly, our preliminary data indicate that our participants may sometimes be drawn to these deeply non-isochronous rhythms.

Sound listening: Before and behind the screen at the blind audition

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Tertiary music students learn traditional performance skills for the music profession, but do not learn to think critically about sound evaluation. Music assessors are not as well prepared to assess sound as they imagine, have limited vocabulary to describe what they hear and are influenced by visual and extra-musical aspects of performances. The aim of this study is to examine music students' experiences of music performance evaluation as auditionee and auditioner in a mock audition. Auditioners experienced live-performances where the auditionees were behind a screen as if at a blind audition, then visible to the panel. The student audition panel was invited to evaluate performances, and make any notes they deem necessary to help discuss them after the performances. Performances were audio and video recorded behind the screen, and arranged into three presentation conditions, Audio-only, Visual-only and Audio-visual, each prepared in randomised order. In a second session, students from the live-audition reviewed the original performances in each presentation (A, V, AV) and were invited to select their top performers. They also formed a panel to discuss performances, and the role of sight and sound in the evaluation process. Results of the panel discussions and written evaluations will be discussed in light of recent research in performance evaluation. This project will equip future music professionals with discerning listening, appraisal and communication skills to develop more robust and transparent music performance assessment practices.

Does vision of a partner help auditory-motor coordination? Bouncing in synchrony with auditory rhythms alone and with another

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Group dancing, coordinating movement with music and others, is a social behavior that is observed extensively in human culture from ancient times. Previous research on interpersonal coordination has demonstrated that unintentional visual coupling occurs during interpersonal interaction and degrades performance in visual-motor coordination.

The purpose of this study is to investigate whether such unintentional coupling occurs in musical contexts and affects individual auditory-motor coordination dynamics. Paired participants were asked to bounce with auditory rhythms in two coordination conditions (Flexion-on-the-beat vs. Extension-on-the-beat) and two interpersonal conditions (Pair vs. Solo). In order to investigate coordination dynamics, the metronome frequency was set to increase from 80 to 160 beats per minute within each trial.

The results indicate that the phase transition frequency where the Extension-on-the-beat mode changed to the Flexion-on-the-beat mode was different between two interpersonal conditions, and

the relative phase between paired participants was closer to zero in the Pair condition than in the Solo condition. The variability of auditory-motor coordination was not different between Pair and Solo conditions.

The findings of present study suggest that unintentional visual coupling occurs in musical contexts and changes the individual dynamics of auditory-motor coordination but not the variability of coordination.

Embodied imagery: The gestures and movements carried out by Western Classical singers away from the audience

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Conventions surrounding the use of gestures and movements in classical singing performance are diverse and dependent on genre and situation. Whilst at times quite extensive gestures and movements may be required in staged productions, recitals - as well as auditions and exams - traditionally call for physical restraint and gesturing is here only considered appropriate on the subtlest level. Literature on gestures, body-language and movement in voice performance focuses on their pivotal role in communication – both between fellow performers and between performer and audience. There is however some anecdotal evidence that singers also gesture, and often even extensively so, in the absence of an audience or colleague – for instance in a recording studio or practice. Far from being simply a dry-run of stage movements, these 'private' gestures and/or movements appear to be rather distinct from the ones observed on stage and, as they are obviously not aimed at an audience, their existence suggests that they are carried out solely for the benefit the singer as a kind of 'embodied imagery'. This paper juxtaposes the gestures and movements used in singing performance with those encountered in the studio or practise and gives an overview of the research surrounding the same. It then reports from a pilot study that investigated if moving about when singing and illustrating sung phrases with hand gestures made a difference to singing voice and musical expression that could be discerned by expert listeners in a blind listening evaluation. Preliminary findings suggest that gesturing/moving whilst singing lead to greater vocal freedom and increased if at times arguably exaggerated expression. The paper concludes with a road-map to future research in this area and discusses potential implications for the teaching of singing.

The E-Music Box: An empirical method for exploring the universal capacity for musical production and for social interaction through music

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Humans are assumed to have a natural – universal – predisposition for making music and for musical interaction. Research in this domain is, however, typically conducted with musically trained

individuals, and therefore confounded with expertise. Here we present a rediscovered and updated invention – the E-Music Box – that we establish as an empirical method to investigate musical production and interaction in everyone. The E-Music Box transforms rotatory cyclical movements into pre-programmable digital musical output, with tempo varying according to rotation speed. The user's movements are coded as continuous oscillatory data, which can be analyzed using linear or nonlinear analytical tools. We conducted a proof-of-principle experiment to demonstrate that, using this method, pairs of non-musically trained individuals can interact according to conventional musical practices (leader/follower roles and lower-pitch dominance). The results suggest that the E-Music Box brings 'active' and 'interactive' musical capacities within everyone's reach. We discuss the potential of this method for exploring the universal predisposition for music making and interaction in developmental and cross-cultural contexts, and for neurologic musical therapy and rehabilitation.

The role of acoustic intensity and loudness in time-series models of perceived affect expressed by music

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In the fields of music and emotion, investigations of causal relationships between acoustic and perceptual parameters have shed light on real-time factors that underpin affective response to music. The study reported here aimed to distinguish the role of acoustic intensity and its perceptual correlate of loudness in affective responses to music from multiple genres (Western Classical, Electroacoustic, and single-timbre synthesized stimuli). This was achieved by first subtly distorting the inherently strong psychophysical relationship between loudness and intensity using synthesized reverberation, and then analyzing the consequences of this for continuously perceived affect expressed by music. Two groups of participants continuously rated loudness (N=31) and perceived arousal/valence (N=33) in response to three musical stimuli ranging between 2-3 minutes in duration. Each stimulus consisted of three continuous segments with three manipulations of the second segment: 1) original acoustic profile; 2) reverberation introduced to decrease loudness but with the intensity profile of the original closely maintained; 3) reverberation introduced but the intensity profile increased by a mean of 3dB SPL. We hypothesised that intensity and loudness both make a significant contribution to time-series models of perceived affect. Three types of time-series models are presented: the first allows intensity but not loudness as predictor, the second allows loudness but not intensity, and the third allows intensity and loudness together. In sum, time-series modeling shows that both intensity and loudness are predictors of continuously perceived arousal and, to lesser extent perceived valence, but loudness is more powerful and sometimes dominant to the point of excluding intensity.

Cross-domain transfer effects after distributional learning of musical pitch categories

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Non-tone language listeners often have difficulty perceiving lexical tones (as used in tone languages in which pitch is phonemic). However, evidence suggests that extensive musical training may provide listeners with an advantage in perceiving and learning lexical tones and thereby exhibiting a cross-domain transfer effect. What is not known, however, is whether musical training needs to be extensive in order for such cross-domain transfer to occur, or whether training that emphasizes the meaningful acoustic cue is sufficient.

To investigate this, we used a distributional learning paradigm; we trained non-musician adults on a continuum that spans two novel chords that corresponds to either a Unimodal distribution (where the modal peak is in the centre of the continuum) or a Bimodal distribution (where the modal peaks are towards each end of the continuum). Before and after training, participants completed a discrimination task, in which they had to discriminate novel music chords (within-domain) and Thai lexical tones (cross-domain). It was hypothesized that if learners trained on a Bimodal distribution, but not those trained on a Unimodal distribution, discover the use of pitch in a meaningful way (i.e., to differentiate the two novel chords), then the Bimodal group will show an improvement in discriminating within-domain and cross-domain test items whereas the Unimodal group will not.

Our results support this hypothesis. This indicates that the knowledge inferred via distributional learning is somewhat abstract and can be applied across different auditory domains, at least when it concerns a common acoustic cue in speech and music.

For the sake of musicality: A new analysis of Soviet ballerinas' approach to interpretation

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Throughout these last three decades much has been discussed regarding the Russian ballerina and her evolution from performer to a virtuosic athlete-like artist, physically gifted according to the modern aesthetic expectations of ballet. Virtuoso bravura has progressively started to gain more and more attention, to such an extent that today it has become important for many ballet dancers to hold poses and balances far beyond the end of a musical phrase, a strategy that allows them to show off their skills. In the past, Soviet ballet supported a different way of dancing. Artists were able to merge their ballet technique with acting strategies, a process that allowed Russian ballet experts such as Elena Fedosova (2003) to consider ballerinas not only *tantsory* (dancers), but also *aktrisy* (actresses). Basing my analysis on the comparison of these two different approaches in two different

eras, my paper aims to illustrate the way in which the most famous Soviet ballerinas were searching for an ideal form of interpretation. Among the different strategies in use to convey this sense of personalised interpretation was their musicality, a quality defined by the dance historian Carlo Blasis (1830) as a tool to create a 'dramatic illusion'. This quality enabled dancers of the past to merge their technical skills with their musical interpretation, where this latter emerged through the execution of movements based on the observance of tempi and the structure of musical phrases.

Implicit learning of an artificial grammar structure in pitch and/or time

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Can listeners implicitly learn an artificial grammar (AG) using non-equal-tempered pitches and/or irregular durations? Using a cover task, we exposed musically untrained listeners to sequences that followed an AG from previous research (Tillmann & Poulin-Charronnat, 2010), either in pitch with isochronous durations (AGp), in duration with monotonic pitch (AGd), or in pitch and duration (AGpd). In Experiment 1 (N=60), the subsequent test phase (grammaticality judgement) showed chance performance for AGd (M=50%, SD=10), but above chance for AGp (M=59%, SD=10), and AGpd (M=67%, SD=10). Experiment 2 (N=107) used a more distinctive set of durations, improving AGd performance to above-chance levels (M=54%, SD=9), matching AGp performance (M=57%, SD=11), while AGpd again did best (M=68%, SD=11). In Experiment 3 (N=105), the AGp condition was implemented not with isochronous durations, but rather with a random set of durations (not adhering to the AG); similarly, the AGd condition used a random set of pitches. The AGpd condition was the same as Experiment 2. Learning was successful in the AGp condition (accuracy M=56%, SD=8), but not in the AGd condition (M=52%, SD=9); AGpd was at 70% (SD=11). Results suggest that unless the duration values are distinct and pitch variations absent, listeners have difficulty learning an AG in an irregular temporal system. However, the superior performance of the AGpd condition shows that the presence of the AG in duration nonetheless aided learning relative to AGp in Experiments 2 and 3. These findings contribute to the literature on implicit learning of artificial grammars, pitch-time integration, and music perception.

Personal music listening: Modelling emotional outcomes through mobile experience sampling

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Personal music listening has become central to everyday music use, with mobile technology defining a new era of music consumption. This portable and flexible style of listening allows for the immediate selection of music to fulfil emotional needs, presenting it as a powerful resource for emotion regulation. The experience sampling method (ESM) is ideal for observing personal music

listening, as it assesses current subjective experience during natural everyday music episodes. The current study aimed to develop a comprehensive model of personal music listening, and to determine the interaction of variables that produce either hedonic benefit or detriment. Data were collected from 195 participants using the MuPsych app, a mobile ESM designed for the real-time and ecologically valid measurement of personal music listening. Multilevel structural equation modelling was utilised to determine predictors of emotional outcomes on both experience and listener levels. Results revealed the strongest predictors of affective change to be initial emotional state and selected music, with certain interactions of these variables critical in determining hedonic benefit or detriment. Furthermore, it was demonstrated that emotional outcomes of listening are produced almost entirely within contexts, with relatively little influence from the listener level. This comprehensive model has provided unprecedented insight into personal music listening, and the variables that are influential in producing desired emotional outcomes.

Illuminating the mysteries of rhythm

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Rhythm is one of the most important attributes of music in almost all traditions around the globe. Aspects of rhythms such as metrical grouping are very common, but their expression and complexity may vary widely across cultures. Some rhythms have become very popular across many cultures, others have remained culture specific, while thousands of mathematically plausible rhythmic patterns never naturally occur. Furthermore, some rhythms seem naturally enjoyable and easy to play for some people, but incomprehensible to others. Attempts to describe the perceptual complexity of rhythms have relied on mathematical models of meter and syncopation that have been tested with very few rhythmic exemplars on a culturally constrained participant population. We will address this shortcoming of previous research to understand rhythmic complexity by using a web-based experiment in which any set of all mathematically possible eight and twelve beat rhythms will be presented to people from a wide range of cultural backgrounds. We will ask people to tap along to rhythms using the space bar on their computer and we will measure their accuracy. We will also ask people to describe their musical background, and rate the familiarity, difficulty and enjoyment of each rhythmic example. We hypothesize that rhythmic difficulty will be inversely related to familiarity, and that people with African musical heritage will find 3-beat meters easier to play and more enjoyable than people with European music heritage, regardless of the computed complexity based on the level of syncopation. Data collection will begin early in September 2015, so in this paper we will outline current mathematical approaches to understanding rhythmic complexity, present the experimental methodology, some preliminary data and analyses, and tentative conclusions drawn from the existing data set.

Introducing the MUSEBAQ: A comprehensive and modular instrument for assessing musical engagement

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Measuring engagement with music is complex and multidimensional. The MUSEBAQ is a newly developed and psychometrically tested modular instrument which assesses a diverse set of music engagement constructs. The MUSEBAQ can be administered in full, or by module as relevant for specific purposes. Evidence was obtained from over 3000 adults (aged 18-87) for its structure, validity and reliability. Module 1 (Musicianship) provides a brief assessment of formal and informal music knowledge and practice. Module 2 (Musical Capacity) measures emotional music sensitivity (α=.90), listening sophistication (α=.76), indifference to music (α=.59), music memory and imagery (α=.81) and personal commitment to music (α=.80). Module 3 (Music Preferences) classifies preferences into six broad genres - rock or metal, classical, pop or easy listening, jazz, blues, country or folk, rap or hip/hop, dance or electronica. Online administration uses adaptive reasoning to selectively expand sub-genres, while minimizing time demands. Module 4 (Reasons for Music Use) assesses seven motivations for using music; musical transcendence (α=.90), emotion regulation (α=.94), social, music identity and expression (α=.90), background (α=.80), attention regulation (α=.69), and physical (α=.71). The comprehensiveness, yet flexibility, of the MUSEBAQ makes it an ideal questionnaire to use in research requiring a robust measure of music engagement.

Personal identity narratives of therapeutic songwriting participants following Spinal Cord Injury: A descriptive case series analysis

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Therapeutic songwriting has demonstrated recent efficacy as a means of reconstructing fractured post-traumatic identities (Baker, Kennelly, & Tamplin, 2005). Identity is a key driver of psychosocial adjustment following traumatic injury. Spinal Cord Injury (SCI) patients face unique identity challenges stemming from the nature of their physical limitations and associated participation restriction. This population also experiences significantly higher comorbid depression, suicidality and reduced subjective wellbeing. Although reintegration of identity is a significant barrier to adjustment, it is seldom addressed in subacute settings where pressing physical and functional needs predominate. Therapeutic songwriting serves as an important vehicle for consideration of identity issues in a subacute care setting. The current study addressed an acknowledged paucity of research on the subjective experience of SCI patients (Samuel, Moses, North, Smith, & Thorne, 2007) by exploring post-injury adjustment in a group of nine SCI patients in subacute care (mean 2.88 months post-injury). Patients engaged in a six-week therapeutic songwriting intervention (see Tamplin, Baker, Macdonald, Roddy, & Rickard, 2015, for intervention protocol) to promote integration of past, present and future selves. The current paper presents personal identity narratives and trends in measures of identity, subjective wellbeing and mood across the intervention period. Consideration is also given to factors including prior psychopathology, significant life events,

age, and gender. The findings contribute to growing literature on the role of music therapy in enhancing post-traumatic well-being.

Using pattern-classification methods to examine the neural representation of pitch and tonality: A pilot MEG study

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Melodic sequences typically adhere to syntactic rules that instantiate the perception of a tonality. Behavioural studies have elucidated the influence of such musical syntax on pitch perception, revealing a hierarchical structure in which notes are accordingly arranged along a stable-unstable continuum. The current study tests whether these geometric models of pitch perception, obtained at the psychological level, are consistent with the underlying structure of neural representation. Specifically, we use techniques such as multivariate pattern analysis (MVPA) of Magnetoencephalography data to examine the influence of tonality on the neural representation of pitch. Recent work in object recognition has used such pattern-classification methods to uncover the representational structure of objects in visual areas of the brain. This is possible because the pattern of activity produced by exemplar objects is more similar to other within-category exemplars relative to exemplars from the opposite category. In the current study, trials consisted of a contextual chord sequence followed by a probe note. Two unrelated context tonalities were used in blocked design. Four possible probe notes comprised the two most and two least stable pitches for a given context – their stability reversing across the two tonalities. Thus, the current design enabled a representation of pitch (classifying different pitches within one tonality) whilst also examining the representational space of two unrelated key regions (classifying tonal context given pitch). Pilot results indicate a rich time-evolving representational structure in which the pitch of a probe note and its implicit tonal context is directly decodable from the neural data.

I missed the chain and Claude Debussy: Death and transfiguration of expectancy theory

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This paper proposes that the most expected event to happen in a piece of music is what actually happens for the particular piece of music under scrutiny—that is, the veridical expectation—regardless of the extent to which it satisfies gestalt or schemata driven tendencies/likelihoods. If a 'portion' of incoming music is not familiar it is segmented until a match is found. With no match, the piece requires additional coding, e.g. through further exposure. Segments are then linked together to form a new veridical representation of a new piece. The linking is referred to as veridical segment

cross chaining, or 'veridical chaining' (VC). The VC hypothesis has several implications, three of which are: (1) Music analysis could focus on tracing the origins of a musical information unit – e.g. a melodic fragment, a particular rhythm pattern, a particular timbre – for a typical or specific individual, rather than assuming that all listeners enact the currently adopted rules of music theory and generalised psychological principles of top down and bottom up processing. (2) The long and/or complex lists of rules/principles of existing music processing theories can be replaced by the single, simple principle of VC which then weaves itself through a vastly complex network, but fundamentally based on the single principle. (3) VC does not need to be in operation at the exclusion of other theories. From a composition perspective the hypothesis should be able to explain the lineage of nearly all music, including that composed by Debussy and Richard Strauss.

The signature of expression: How Jazz saxophonists use the beat to achieve expression in improvised and scored music

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When performing with other musicians, a soloist can use the beat and meter as a framework upon which they base the timing of their sound productions. The beat is a regular pulse perceived in music and meter is the grouping of beats into equal measures. By alternating between conforming to and violating the expectations implied by the beat of co-performers, musicians can communicate expressive intent. We examined how jazz saxophonists change the timing of their sound productions relative to the beat (i.e., asynchronies) as a function of playing expressively or unexpressively, and when adhering to the notated score or improvising. In a within-subjects design, tenor saxophonists (N=6) performed two jazz songs with backing tracks that included both scored and improvised sections. Participants were asked to play the songs expressively and unexpressively in different performances. We hypothesized that asynchronies are larger and more variable for expressive performances than for unexpressive performances, and for improvised sections than for scored sections. Results demonstrated that expressive performances demonstrated larger negative asynchronies than unexpressive performances for the improvised sections but not the scored sections. The improvised sections also yielded larger negative asynchronies than written sections. Contrary to hypotheses, improvised sections demonstrated greater variability for the unexpressive than expressive performances and scored sections demonstrated the inverse effect. Taken together, these results indicate that expressive performance is characterized by consistent negative asynchronies when improvising and larger variability around the beat when adhering to the score. Results are discussed through the lens of arousal and violating temporal expectations.

The impact of vocal timbre on sung word perception

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Vocal timbre analysis in popular music is an area of study that is in its infancy due to a lack of appropriate analytical techniques. This is largely due to vocal timbre (the unique sounds of a singers voice, particularly when expressing emotion) being difficult to represent in traditional musical notation (i.e. lacking appropriate graphical representation), which has impeded more rigorous analysis. Consequently, popular music analysis has suffered as vocal timbre, although not yet well understood, is increasingly being recognised a significant musical parameter within this genre. This research aims to address this through developing a new method of analysis for vocal timbre in popular music by posing the question: Does vocal timbre carry emotional meaning? To test this, an experiment was designed which primed participants with an emotionally charged vocal timbre, then presented them with an emotionally charged word. It was reasoned that, if vocal timbre carries emotional meaning on its own, we should see facilitatory and/or inhibitory effects of the one on the interpretation of the other. Results confirm this, showing that participants are faster and more accurate at identifying the emotional valence of words when these are sung in an emotionally matching vocal timbre than when they are sung in an emotionally mismatched vocal timbre. Vocal timbre can thus act as an emotional prime, affecting the speed and accuracy at which words are processed for emotional valence. This suggests that vocal timbre alone does express emotional meaning.

"The Memory Challenge": A new method for investigating expert memory for contemporary dance

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The workings of long-term memory are illuminated not so much by what is remembered, but by what is forgotten. The brains of dancers are embodied records of set works that have been created, rehearsed and performed. Dancers' precision in recalling extended, multimodal sequences defies the conventional methods used to investigate memory. Collaborating closely with members of Australian Dance Theatre, we set out to develop a new method that elicits memory recall and lapsing. Dancers were divided into two "teams" with each team asked to choose excerpts for memory recall from the company's extensive repertoire that would challenge individual dancers in the other team. There were 14 trials; 12 involved recalling a solo and 2 a duet. In the ADT studio, dancers recalled (reproduced) as much of the excerpt as possible in the absence of an accompanying soundscape. Recall was recorded, after each trial the dancer described the process in writing, and a post-recall focus group was conducted. Recall was extensive but also contained lapses. Spatial location of starting position was evident. The time frame was slower when recalling with material tending to be remembered in chunks. When more was remembered it was chunked and sequenced accurately; when less, there were movement fragments, often out of order. Transitions were smooth even when lapses occurred. The original performer doing the movement was imaged. Recall

tended to be greater for material that had been performed. We discuss the results and the potential of the "Memory Challenge" as a new research paradigm.

Stereotyping moderates cross-cultural emotion perception in response to music

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An investigation of music psychology literature on cross-cultural emotional perception revealed that anger does not appear to be communicated in a systematic way. Because it is widely accepted that basic emotions are universal, and anger is considered a basic emotion, this finding is puzzling. This paper proposes a theory to explain the variance in cross-cultural emotion perception in response to music. According to the theory, Stereotyping Theory of Emotion in Music (STEM), the way emotions are encoded by a musician and decoded by a listener are transmitted by the cultural carrier of stereotyping. Hence, if we consider anger to be a basic emotion, and basic emotions are universal, the way those emotions are presented must then go through a cultural carrier (the music) and filter (stereotyping).

While the theory accounts for cross-cultural perception and communication, it also explains why particular emotions are better communicated in specific musical genres than others. This explanation suggests that STEM can be generalized to account for emotion perception more generally, beyond cultural boundaries. The implications of this proposed resolution for future research are discussed.

Therapeutic songwriting to address self-concept and wellbeing post neurotrauma: Preliminary evaluation of mechanisms of change

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Preliminary evidence suggests songwriting can assist people with spinal cord injury (SCI) or acquired brain injury (ABI) to explore threats to self-concept. In a pilot study we explored mechanisms of change active during therapeutic songwriting with people in sub-acute rehabilitation. We found correlations between changes in self-concept and wellbeing, with mechanisms of flow, meaningfulness of songwriting (MoS), and mood. Five ABI (all male) and 5 SCI adults (4 males, 1 female) (mean age 38.90 years, SD=13.21), with an average 3 months post injury, participated in a 12-session songwriting program targeting exploration of self-concept. Measures of self-concept, depression, anxiety, emotion regulation, affect, satisfaction with life, and flourishing were collected pre, mid, and post-intervention, and compared with repeated measures of flow, MoS, and mood. Improvements in self-concept over time were associated with decreases in depression, anxiety, and negative affect, and an increase in flourishing and positive affect. Experience sampling of emotional state pre-post songwriting sessions showed improvements in valence, arousal, and control. Positive

songwriting experiences (ie. High flow and MoS) were associated with increased negative affect and reduced suppression of emotions on discharge. This may indicate that people with positive songwriting experiences are more likely to start accepting their emotions and as a result experience an increase in anxiety and depression, although full mediated regression analyses with larger sample sizes are planned to explore this further. Acknowledging and processing changed circumstances through songwriting may nonetheless assist people with SCI and ABI to grieve losses and facilitate development of a healthy, post-injured self-concept.

Movement and informational constraints in joint drumming

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Musical ensemble performance requires individuals to be perfectly coordinated in time. Here we investigated the influence of informational and individual movement constraints on interpersonal coordination in joint drumming. Sixteen pairs were instructed to drum together in a synchronization-continuation task. Participants synchronized together with a 1 Hz or 2 Hz metronome for 5 beats and then maintained synchrony at this specific tempo for 60 additional cycles. Participants drummed either when facing together or facing apart to manipulate the availability of visual information. Individual movement dynamics were manipulated by changing the position of a 30g weight attached to the drumsticks. The weight was positioned either at the middle or the tip of the drumsticks, and participants used either same or different drumsticks. We recorded the tap timing as well as the movement kinematics of the drumsticks and participants' body sway using a Vicon motion capture system. Interestingly, the results showed that movement constraints influenced temporal leader-follower relations. The analyses of the taps and drumstick kinematics demonstrated that the participant with the weight positioned at the tip of the stick led in time. Furthermore, coordination stability was not influenced by individual movement constraints but was modulated by the availability of visual information. Coordination variability was reduced when participants could see each other, especially when they had to maintain the slow tempo. These results open new perspectives to better understand the complexity of interpersonal coordination during musical ensemble performance.

Smooth glissandi: How do singers do it?

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During singing (and speech) the vibrating vocal folds are connected to a resonant duct upstream (trachea) and downstream (vocal tract), each of which provides an acoustic impedance which acts as a load on the vibrating source. Some models suggest that vocal fold vibration is more stable when the vibration occurs below a vocal tract resonance (so that downstream load is inertive or mass-like). In this case, vocal fold vibration may be unstable when the vibration and the resonance frequencies 'cross over', which usually occurs near 500 Hz for adults.

We asked singers to perform glissandi on different vowels, taking the sung frequency (fo) across the vocal tract resonance R1 and the subglottal resonance. For one vowel we fixed the mouth geometry with a ring between the lips, to inhibit or to reduce resonance tuning (a common phenomenon in singing in this range). We also asked them to produce a slow diphthong at constant pitch, i.e. moving the tract resonance across fixed f0. Finally, we examined phonation into a load with no strong resonances, using an acoustically infinite duct at the lips.

Results showed no strong relation between instabilities and resonant frequencies when singers' mouths were unconstrained. Experiments where mouth aperture was constrained found that instabilities were more common once fo crossed the expected value of R1. This suggests that the acoustic load can play an important role in maintaining stable vocal fold vibration. Happily for singers, it also shows that singing is possible even without an inertive load.

The acoustic features of emotional nonverbal vocalisations

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Nonverbal vocal expression of emotion is central to human communication, but research into the acoustic features of vocalisations that make emotion recognition possible has proved inconclusive. This study examines the distribution of vowel formant energy, pitch, harmonic to noise ratio, intensity and impulsivity of nonverbal expressions of the six basic emotions; anger, disgust, fear, happiness, sadness, and surprise. 922 nonverbal vocalisations spontaneously generated by 60 participants were analysed using Praat software. Repeated measures ANOVAs showed significant differences between the frequencies of the first three formants of the vocalisations for the different emotions, suggesting that non-verbal emotional expressions are associated with different vowel sounds. There were also significant differences between the pitch, Harmonic to Noise ratio, intensity and two measures of impulsivity for different emotional expressions. Finally, the vocalisations were rated on recognisability and arousal and the various relationships between these scales and the acoustic measures will be described for each emotional expression. These findings enable both the emotional valence and arousal of human nonverbal expressions to be analysed from their acoustic properties. They provide the first account of the use of vowel sounds in human nonverbal emotional expressions, along with other acoustic properties that are involved in encoding the valence and level of arousal of these expressions. This research also provides a context for evolutionary comparisons with verbal communication amongst other primates and mammals and for comparisons with musical emotional expression, particularly in song.

Working memory for actions: Facilitation from entrainment to an auditory cue

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In the context of verbal memory the presence of a regular auditory beat facilitates learning. We investigate facilitation from a regular auditory beat for working memory for human actions. On each trial of a recognition task, four whole body actions were presented as a study set, followed immediately by a test set of four actions. The task was to recognize whether the test set actions were the same or different from the study set. Half of the trials were different with a single action replaced from a set of eight actions. The presence of an auditory beat coinciding in time with presentation of the visual action stimulus was manipulated across study and test sets. The crossing of the auditory beat being either present or absent across study and test sets produced four conditions: beat study-beat test; silent study-silent test; beat study-silent test; silent study-beat test. A fifth control condition was included wherein the visual action and auditory beat were mismatched in time. It was hypothesized that recognition is greater when an auditory cue is synchronized with the action items during study than when an auditory cue is mismatched or absent. Thirty participants completed 100 randomised trials. Descriptive results suggest facilitation from the presence of the synchronized auditory beat with highest accuracy recorded in the beat study-beat test condition (d'=1.15) followed by beat study-silent test (d'=0.95); silent study-silent test d'=0.94 and mismatched d'=0.83. The results are interpreted according to Dynamic Attending Theory and implications for learning and rehabilitation are discussed.

Vocal emotion processing, empathy, and features of the Broader Autism Phenotype

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There has been little research investigating whether the ability to accurately identify human emotions from vocal expressions is associated with empathy or autism-related features, known as the Broader Autism Phenotype (BAP), in the general population. We examined associations between these constructs in a sample of typically developing adults (N=62) who completed self-report measures of empathy and the BAP, along with a novel web-based program assessing emotion recognition accuracy and arousal ratings for a validated set of nonverbal vocal expressions. Our findings suggest that empathy correlates significantly with the ability to recognise and rate the arousal of a subset of basic emotions, although effect sizes were small. BAP features of aloofness and rigid personality were also positively correlated with the ability to recognise anger, with small to medium effect sizes. We performed cluster analyses to explore individual differences in emotion

recognition ability, revealing four subgroups of participants with distinct performance profiles: 1) high accuracy across emotions, 2) low accuracy across emotions, 3) low fear accuracy, and 4) low surprise accuracy. The subgroup with low fear accuracy demonstrated lower fear arousal ratings and relatively lower IQ, while the subgroup with low surprise accuracy demonstrated lower surprise arousal ratings. There were no significant differences in self-reported empathy and BAP features between the subgroups. The implications of our findings for understanding factors that influence vocal emotion processing in the general population and in Autism Spectrum Disorder will be discussed.

Poster Abstracts
(alphabetical order)

An investigation of emotional response to sonorism in music from 1960 – 1991

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Research into emotional and physical response to tonal music has been the focus of several studies, but not for music with no tonal centre. This study investigated emotional response, including the physical, to sonorism in music from 1960 – 1991, in particular works which do not rely on a tonal centre. Sonorism, a term often applied to avant-garde methods developed by Polish composers in this time period, places the focus on the textural and sound mass elements found in the music samples. A qualitative and phenomenological approach was adopted to obtain responses from two participant groups: seven academic staff were interviewed to obtain an in-depth understanding of what twentieth century music undergraduate students are taught; and eleven music students who listened to five music excerpts drawn from sonorist works.

Results from the academic group gave an overview of composers' works introduced to students (including Stockhausen, Lutoslawki, Cage, Reich, and Saariaho). 57% of academic participants indicated use of scores to illustrate instrumental techniques and texture, however, little information was given on how students were taught to listen to texture and soundmass. After listening to the musical excerpts, music student participants reported emotional and physical response (including happiness, anxious, fear, despair, isolated, calm and excited). Physical response showed an increase and decrease in breathing, tingling and tension of the skin. Texture, timbre, volume, pitch and dynamics were reported to have led to these responses. Emotion recorded at the beginning and end of the listening session changed, or remained the same.

Conclusions indicated a lack of teacher focus on listening, analysis of major 20th century composers in undergraduate teaching, and, perhaps related, an inability of the listener to deconstruct complex elements in music samples. Listener responses ranged from happiness to fear, elation to shock, and in some cases emotion was not reported. Listeners also indicated a reduced ability to focus on physical response which may have been due to psychoacoustic fatigue.

Investigating performance differences on temporal order judgment tasks between musicians and non-musicians

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In the temporal order judgment (TOJ) paradigm, an individual is typically asked to judge the order of two stimuli presented close in time. Previous studies have successfully used TOJ tasks to investigate

temporal and spatial limits of tactile perception, e.g. identifying exactly when and where a tactile stimulus occurs. These tasks tend to yield strong effects, especially when the stimuli are presented to the hands and/or fingers. An example of a robust TOJ effect is the 'crossing effect', where the ability to correctly localize stimulus in TOJ tasks is impaired when the hands and/or fingers are crossed and situated contralaterally to their controlling hemisphere of the brain. The following study examines the performance of musicians and non-musicians on TOJ tasks. Occupation-dependent manual action and long-term experience with repeated use of the hands and fingers has been shown to influence performance on tactile perception tasks. It is of interest if the temporal and spatial limits of tactile perception are consistent across both groups, and if musicians are as susceptible to the TOJ crossing effect as non-musicians.

A qualitative analysis of Arabic language music queries

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This paper presents an analysis of 100 music related questions from the Arabic language Q&A website alsahar. The questions and the most highly rated answer for each question were automatically translated to English using Google Translate, and then the translations were verified and, if necessary, manually translated by a native Arabic speaker. These question/answer pairs are categorized by the types of detail used to characterize the poster's information need, the type of music information requested, and additional social and contextual elements present in the postings. We explore the music information system design implications that emerge from our analyses and classifications, and compare these findings with the recommendations for English-based music information systems.

To date, the majority of studies of music querying behavior has focused on English language queries, with a few small-scale studies of Korean and Chinese language queries. To our knowledge, this is the first exploration of Arabic language music querying. We also explore the cultural and religious factors that impact the acceptability of posting music questions in publicly accessible sites, and the effect of these factors on the query format and topics.

Music for Sound Health: Utilising a theoretical musical framework for invoking relaxation, implemented through a generative-music smartphone app

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Patrick Juslin's BRECVEMA Model was used to develop a framework for using music to induce relaxation, through identifying how specific musical elements could be tailored to help induce positive affective tone and low arousal – the essential elements of relaxation. Music research concepts informed the manner in which the musical elements were tailored (e.g. fusion, roughness and equal-loudness contour).

The principles from the framework underpinned the development of the 'Music for Sound Health' app, a generative anxiolytic music smartphone application. This application composes relaxation music and supports user manipulation (e.g. varying instrumentation, tempo etc.).

Three-minute recordings from the app were trialled on thirty-three individuals for self reported stress levels. Recordings updated every (approx.) 8 participants were compared against three-minutes of silence as control. A Likert Scale from one (low felt stress) to ten (high felt stress) revealed an average decrease in self-reported stress of 1.63 after listening to the recordings (2.85) versus after silence (4.48). This suggests a relaxation app developed from the above framework can aid in stress management.

Participants gave qualitative answers on the musical elements that made them feel stressed/relaxed. This informed the updates and revealed possibilities for further development of the framework. An imbalance of musical variation (too little or too much) reoccurred as 'stressful' feedback but appears to be rather subjective. The degree of variation and a hierarchy of salient variation of musical elements are areas for further investigation.

The influence of visual information on auditory processing in individuals with congenital amusia: An ERP study

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People with congenital amusia report that they often rely on facial expressions and gestures when interpreting the moods and feelings of people with whom they are speaking (Thompson et al., 2012). To get a better understanding of the extent to which amusic individuals rely on the visual modality, the present study compared behavioural and EEG responses to pitch changes with or without task-irrelevant visual information for amusic and control participants. The preliminary results showed that individuals with amusia were more easily affected by unattended visual information, regardless of whether it was congruent or incongruent with the pitch change direction, when compared with controls. Furthermore, for the control group but not the amusic group, the incongruent audio-visual (AV) pairings elicited a larger negative deflection in comparison to congruent AV pairings 280-380 msec after the stimulus onset. We next examined whether the absence of a congruence effect in the amusic group is caused by an inability to detect the AV conflicts. Participants were required to judge AV congruence explicitly by reporting whether the change direction of visual information is congruent with the change direction implied by pitch change. The ERP amplitudes in response to congruent and incongruent AV pairings were significantly different for both the control and amusic groups. These results indicate that amusic participants tend to ignore AV conflicts and make unconscious judgements based on task-irrelevant visual information. We discuss the idea that amusics unconsciously rely on the visual modality to compensate for their deficit in auditory processing.

Manual transcription of sung melodies

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Many systems require human-generated ground truth for evaluation of their effectiveness. Typically, automatic music transcription systems are evaluated against perfectly pitched notes generated via MIDI. However, much musical performance involves singing or instruments that have less precise pitch and timing. Our goal was to evaluate automatic transcription systems on singing at different skill levels in different acoustic environments. We chose to use human annotations of pitch for the ground truth.

We recruited four expert musicians to manually transcribe a set of recordings of unaccompanied singing.

The musicians were all skilled semi-professionals: a violinist, a jazz pianist with perfect pitch, and two singers with fluent sight-singing skills. The musicians were asked to annotate the pitch to within half a semitone, and in 100 millisecond time units. The Audacity software was recommended for use for the task. To check inter-annotator agreement, one recording was annotated by all four musicians.

There was some variation in the annotations provided. Musician 4 (the pianist) mapped all notes to exact MIDI note numbers, whereas the other three musicians annotated frequent occurrences of notes that fall between the standard notes. The influence of the standard scale in long-term memory was possibly affecting the the annotations of the fourth musician. Being a pianist may have also affected their response to pitch, since there is no need for fine-tuning for piano performance, as is required for skilled singing and string playing. While the other three musicians annotated to half-semitone precision, they were not entirely consistent with each other. Using a precision measure, values for pitch consistency varied from 0.72 to 0.89 amongst pairs of musicians.

Pitch recall ranged from 0.73 to 0.92.

We concluded that despite the "Just Noticeable Difference" for pitch being at about 12 cents (Suyoto and Uitdenbogerd 2004), which is much smaller than a half semitone (50 cents), the level of disagreement between musicians made the use of fine-grained pitch evaluation of audio recordings via human judgements infeasible.

Examining error processing in joint action

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Errors are rare but important events that have consequences and require some adaptation of action. When acting together, these consequences are often shared by the co-actors. During joint actions, people need to monitor their own activity, the activity of co-actors, and progress toward the shared goals of the action. However, when performing the exact same action at the same time and with the same expected outcome, it can be difficult to tell who is responsible for the outcome; the agency of

the action becomes ambiguous. Previous research has shown that people slow down their actions after making an error, and also when a co-actor makes an error. Electroencephalography (EEG) studies have shown consistent patterns of electrical activity in the brain when an error is made, both for one's own errors and errors made by a co-actor. However, previous studies have not investigated how agency affects these patterns. Thus, we propose a method for studying how ambiguity of agency affects these error-related event-related potentials (ERPs) for one's own errors and the errors of a co-actor. Music is an ideal way to investigate this because it is a social activity and musicians are familiar with playing with other musicians. Pairs of pianists will play tunes in unison (i.e., playing the same notes at the same time) or in complementary parts. In the unison condition, agency will be ambiguous, enabling the comparison between errors made when agency is ambiguous and non-ambiguous.

Jilkmingan School: Language, song and teaching materials

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In 1994, Katherine Regional Language Centre (KRLC) linguist Denise Angelo put bi-lingual language educator and MPhil linguistics candidate, Mark Richards, in contact with the Jilkmingan community, 35 km south-east of Mataranka in the Northern Territory. The community wished to establish a programme to teach their indigenous language, Mangarrayi , within their primary school. With the aid of Angelo and assisted by singer Gemma Turner, Richards devised lesson plans that involved songs, puppets and other language teaching materials to suit the context of that community.

Music, and in particular song, turned out to play a more crucial role in the success of the project than first anticipated. The authors intended the songs to be a way of creating a framework for enabling students to practise particular language structures within the context of themes chosen for each lesson. It was hoped that the elders identified as the singers and song makers of the community would willing to create songs using the required language structures.

Richards and Turner, who have expertise in performing traditional Hungarian music, presented a concert for the students and local community at the school. This, unexpectedly, proved to be key in gaining the trust of the elders, catalysing their interest in the project and opened the way to a fruitful collaboration, including the creation of a series of songs.

Twenty years on, the presenters will discuss the genesis and implementation of the programme: what worked and what didn't from linguistic and musical standpoints, providing useful points of reference for current Aboriginal language revitalisation programmes. The presenters intend this as a preliminary to initiating a review of the programme's legacy in Jilkmingan community today.

Proactive inhibition enhances sensorimotor synchronisation

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Sensorimotor synchronization (SMS) is the coordination of movement with an external rhythm. The idea that SMS tasks require proactive inhibition comes from a robust phenomenon observed in these studies; when tapping in time to a beat humans tend to make their responses about 20 to 80 ms prior to the beat [referred to negative mean asynchrony (NMA)]. Interestingly, trained musicians generally have less NMA than novices. How might this reduction in NMA be achieved? One clue comes from experiments that have used explicit performance feedback to train non-musician subjects to tap closer to the beat. In such studies subjects have been shown to be able to significantly reduce their NMA by learning to "hold themselves back" in order to delay the tap. Such self-reports suggest that in order to tap closer to a beat (as musicians do) one must learn to overcome a natural tendency (i.e. prepotent response) to anticipate the beat.

To test this idea we developed a new task that combined the SST and the tapping task thereby measuring synchronisation whilst also manipulating proactive inhibition and tested two effector systems: manual and vocal. Manual responding in an irrelevant stop condition was significantly ahead of the beat whereas vocal responding was not. In the relevant stop condition we found that manual responding, but not vocal responding, was significantly delayed compared to RTs in the irrelevant stop condition. These results support the interpretation that proactive inhibition increases sensorimotor synchronisation in a finger tapping task.

The overlap between music- and language-syntactic processing: Evidence from an EEG study of congenital amusia

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The current study is investigating music- and language-syntactic processing in congenital amusia using electroencephalography (EEG). For the music experiment, 80 western five-note-melodies were created with a piano timbre. They were randomly mixed with the same 80 melodies ending with an out-of-key note. Another 40 melodies were included that contain one note with a deviant instrument (i.e. guitar). Participants were asked to detect these timbre-deviants. For the language experiment, five-word English sentences were presented orally. The final word was either syntactically incorrect, semantically incongruent, or syntactically / semantically "correct". To ensure they attended to the stimuli, participants were occasionally required to answer questions on randomly selected trials related to the sentence they just heard. Brain activity was recorded using 64-channel EEG. The results showed that syntactic violations in both music and language elicited similar brain responses in normal controls [early right anterior negativity (ERAN) and N5 for the music task and left anterior negativity (LAN) and P600 for the language task]; Amusics with music-syntactic deficit showed impairment to some extent in ERAN and LAN respectively reflecting the early stage of music and language syntactic processing whereas no group difference were observed

in later stage (i.e. N5 for music processing and P600 for language processing). Further, amusics showed normal N400 reflecting semantic processing.

How do singers sing? Estimating acoustic loads at the source

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Models of speech and singing are based on the production of sound at the glottis (the variable opening between the vocal folds). This sound is produced by the vibration of the vocal folds that must remain stable across a large frequency range, and under varying acoustic loads. Simple models of vocal fold vibration usually predict instabilities under certain loading conditions.

Since it is difficult to observe acoustic effects near the vocal folds directly, this project uses a simple waveguide approximation to determine pressure and flow near the glottis from measurements made at the lips. Further calculations yield properties of the glottal source, which is assumed to accelerate a small air mass (an inertive end effect) in series with a small compliance in the supraglottal space.

We measure sopranos singing over a range of frequencies with altered acoustic loads, achieved by extending their vocal tracts with waveguides at the lips. We report the resultant acoustic pressure and flow and compare them to a simultaneous measurement of the vocal fold contact made by electroglottography, a clinical technique that passes a tiny electric current across the neck at the level of the vocal folds.