Programme, Abstracts & Proceedings

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Chairs' Welcome

Moi kaikille!

Welcome to the 9th International Conference of Students of Systematic Musicology, at the University of Jyväskylä! For nine years, SysMus has been travelling around Europe and the world, and we're terribly excited that this year will be its first excursion into the Nordic countries. It's a pleasure to be hosting you in our little town in the middle of the forest!

Despite Jyväskylä's remote location, it has a prominent place in the international research community, with important research being conducted in the fields of music, education, and sport science. Jyväskylä is a real university town, with one in every four people being students, which makes it a lively place to live and work. It is also home to over 40 choirs, numerous orchestras and bands, as well as the Finnish Music Campus, making music an important aspect of daily and professional life in Jyväskylä.

The university has been very welcoming to foreigners (such as ourselves) who are either on exchange or studying in one of the many international master's programmes, including the international programmes in Music Psychology Training at the music department. From 2008 to 2013, the Music Department hosted the Finnish Centre of Excellence in Interdisciplinary Music Research, attracting international researchers of the highest callibre as well as a number of conferences, and from 2014 Jyväskylä has been investigating the Dynamics of Music Cognition in an Academy of Finland project. Within the Music Department, the international community is represented in both staff and students.

The SysMus project is hugely valuable for student researchers. For many, SysMus may be the first opportunity to present their work to an audience of their peers. As all participants (except for the invited keynote speakers) are students, the atmosphere at SysMus can be very different to a "normal" conference. Discussion time after presentations is often very lively, as all delegates, regardless of their age or experience, are welcomed to contribute. Keynotes are always chosen very carefully, and add to the conference not just through their inspiring talks, but through injecting some of their experience into the discussions that happen throughout the week.

What's more, as an annual conference series, there are many regular attendees who come back every year, relishing the opportunity to keep in touch with other student researchers from around the world. This is where you will meet future colleagues and collaborators. Welcome to the SysMus family!

We would both like to thank the fantastic team we have here in Jyväskylä. We have a particularly large local committee of volunteers this year, mostly from within the Music Psychology Training Masters Programmes (and two PhD candidates who are previous students of the MPT programmes). Their collective enthusiasm has made this event a delight to organise. However, none of this would have happened without the quick thinking and sheer determination of Dr Birgitta Burger. Thank you also to Dr Marc Thompson for organising the 2nd Motion and Music Workshop as a satellite event, and our "hypervisor" Prof. Petri Toiviainen for lending us his experience and selecting the conference dinner wine list. A special thank you must go to Markku Pöyhönen, who actually runs the Music Department in all but title.

Welcome to Jyväskylä! We hope you enjoy your stay!

Joshua Bamford & Susan Johnson
Student Chairs

Supervisor's Welcome

Dear colleagues,

It is my great pleasure to welcome you all to the city of Jyväskylä, the Department of Music of the University of Jyväskylä, and to SysMus16, the 9th International Conference of Students of Systematic Musicology.

SysMus is a conference series for, and organised by, students of research fields related to systematic musicology to give young scholars the opportunity to meet and present and discuss their work among their peers. SysMus is a great way for young researchers to get a taste of what it means to participate in an international scientific event.

As systematic musicology is a very diverse and interdisciplinary field dealing with music as a general phenomenon, I am very much looking forward to the wide variety of different topics, methodologies and paradigms being presented in oral and poster presentations over the coming days. Due to the structure of the University of Jyväskylä's Music Department, comprising of musicology, music cognition, music education and music therapy, this year's SysMus feels truly integrative and multifaceted. It aims to connect the classical areas, such as music psychology, perception, cognition, sociology, philosophy or computing, with growing areas, such as music therapy and music-related well-being.

SysMus16's academic programme includes oral and poster presentations as well as workshops, in which members of the Music Department will give hands-on experience with equipment as well as tools and techniques developed and practised here. Besides the academic programme, SysMus16 offers a broad social programme, including a welcome party, an open-mic night, and a conference dinner, allowing for mingling and for experiencing Finland's long summer days and its beautiful surroundings and peaceful nature.

I cordially wish you an engaging and enjoyable stay in Jyväskylä!

Birgitta Burger
Supervising Chair

Programme Overview

	Wednesday
8:00	Registration (M101/Skaala)
9:00	**Opening Address -** Birgitta Burger (M103)
9:30	**Keynote 1** (M103) Ralph Spintge - *Aspects of music in medicine* Chair: Elsa Campbell
10:30	**Morning Tea/Coffee** (M106/Boombox)
11:00	**Paper Session 1** (M103) Chair: Shawn Michael Condon Noah Little - *A Journey to ecstasy: The lived experiences of electronic dance music festival attendees* Donnacha Toomey - *Paradigms in the compositional practice of Irish singer-songwriters* Christine Ahrends - *Does excessive practicing have addiction potential?* Paul Elvers - *Does empowering music enhance performance and risk-behaviour in sports?*
13:00	**Lunch** (Tilia)
14:00	**Poster Session 1** Speed Poster Talks in M103, followed by poster viewing in M101/Skaala and M104/Fermaatti. See pg. 9.
15:30	**Afternoon Tea/Coffee** (M106/Boombox)
16:00	**Paper Session 2A** (M103) Chair: Esther Coorevits Joshua Bamford - *Empathy and interpersonal synchronisation in the silent disco* Li-Ching Wang - *Embodied rhythm perception: The effect of head movement on rhythm reproduction* Marta Rizzonelli - *Musical feedback: a new strategy in gait training for Parkinson's disease patients* Pedro Kirk - *Sounds within reach: Enriched environments for physical rehabilitation*	**Paper Session 2B** (M106) Chair: Daniel Fiedler Pui Yin Kwan - *Music performance anxiety* Shawn Michael Condon - *Building an emotionally expressive performance* Jessica Akkermans & Renee Schapiro - *Expressive performance and listeners' decoding of performed emotions* Dawn Rose - *Becoming and being a musician*
18:00	End of scientific programme
19:00	**Welcome party** (M106/Boombox)

Thursday

8:00	Registration (M101/Skaala)
9:00	**Opening** (M103)
9:30	**Keynote 2** (M103) Mari Tervaniemi - *Music in our life: Learning and re-learning* Chair: Katharina Schäfer
10:30	**Morning Tea/Coffee** (M106/Boombox)
11:00	**Paper Session 3** (M103) Chair: Emily Carlson Suzanne Ross - *The structure of absolute pitch abilities and its relationship to musical sophistication* Jasmine Tan - *Neural correlates of flow state in musicians* Gabriela Pérez-Acosta - *Cerebral electrical activity triggered by music imagery and music perception* Natalie Kohler - *Music and language in the brain: Investigating the temporal nature of interaction between melodic pitch and prosodic expectancy*
13:00	**Lunch** (Tilia)
14:00	**Workshops** Various locations. See pg. 10.
15:30	**Afternoon Tea/Coffee** (M106/Boombox)

16:00	**Paper Session 4A** (M103) Chair: Pedro Kirk Felix Loß - *Social inclusion as therapeutic and educational factor within a music therapy setting* Nina Politimou - *Links between musical and linguistic skills in young pre-schoolers: The role of the home musical environment* Jessica Crich - *Live music in dementia care: Exploring key stakeholder role demands and training*	**Paper Session 4B** (M106) Chair: Natalie Kohler Keith Phillips - *Are we really hearing in our heads what we think we're hearing?* Imre Lahdelma - *Mild dissonance preferred over consonance in single chord perception* Hayley Trower - *Adults' schematic and veridical expectations in response to melodic repetition*

17:30	End of scientific programme
18:00	**Conference Dinner** - bus leaves at 18:00 from outside Musica

	Friday
8:00	Registration (M101/Skaala)
9:00	**Opening** (M103)
9:30	**Keynote 3** (M103) Justin London - *What is musical tempo?* Chair: Birgitta Burger
10:30	**Morning Tea/Coffee** (M106/Boombox)
11:00	**Paper Session 5** (M103) Chair: Paul Elvers Esther Coorevits - *The role of body movement in coordinated interpersonal timing* Yu-Fen Huang - *How conducting movement's kinematics communicates musical structures?* Timo Varelmann - *Music-visual congruence and attention in film cognition* Jan Stupacher - *Social effects of interpersonal synchronisation during listening to music compared to a metronome*
13:00	**Lunch** (Tilia)
14:00	**Poster Session 2** Speed Poster Talks in M103, followed by poster viewing in M101/Skaala and M104/Fermaatti. See pg. 9.
15:30	**Afternoon Tea/Coffee** (M106/Boombox)
16:00	**Paper Session 6** (M103) Chair: Imre Lahdelma Emily Carlson - *Personality and musical preference using crowd-sourced exerpt-selection* Fabian Greb - *How do the functions of music listening vary across situations and persons?* Katharina Schäfer - *Emotion regulation with music*
17:30	**SysMus General Meeting** (M103) Closing remarks and open discussion Chair: Joshua Bamford
18:30	End of conference
19:00	**Open Stage** (M106/Boombox)

Poster Sessions

Poster sessions will begin with Speed Poster Talks in M103, in which all presenters in the session may give a short, four minute talk about their poster. This will be followed by free time to view the posters and ask questions of the presenters in M101/Skaala and M104/Fermaatti.

Session 1

1. Taren Ackermann - *"I don't like that!" - Why and what for we dislike music*
2. Sara d'Amario - *Electrolaryngography and electroglottography in the assessment of singing voice*
3. Julie Delisle - *Mapping the sound world of the flute: Towards a classification of standard and extended techniques*
4. Daniel Fiedler - *Verification and validation of the Musical Self-Concept Inquiry (MUSCI) to measure 'musical self-concept' of German students at secondary education schools*
5. Saoirse Finn - *The effects of singing therapy on psychological and biological responses with women with postnatal depression (PND)*
6. Nina Fisher - *Does musical training affect emotion processing abilities? Evidence for enhanced levels of empathy in amateur musicians*
7. Zsuzsa Földes - *The effects of synchronous music on patients undergoing Magnetic Resonance Imaging*
8. Marvin Heimerich - *Investigating cognitive mechanisms of social interaction through musical joint action*
9. Susan Johnson - *The influence of rhythmic musical features on gait-related movement*
10. Diana Kayser - *Finding new ways in studying music evoked emotions*
11. Steven Schiemann - *Effects of coaching on generalist primary music teachers' classroom practice and their 'musical self-concept'*

Session 2

1. Franziska Kloos - *Identity as a challenge in arts - Jennifer Walshe and her alter egos*
2. Jukka Kuusela - *How trauma diagnostics could be improved?*
3. Aluizio Neto - *Audio analysis tools on the development of a musically expressive performance*
4. Liubou Pazniakova - *The influence of imitative body movements on the sensitivity to the conductor's expressive timings*
5. Pathmanesan Sanmugeswaran - *Parai melam music in Jaffna Tamil culture, Sri Lanka*
6. Kristal Spreadborough - *Hearing is believing: Towards a new method of analysis for vocal timbre in popular vocal song*
7. Claudia Stirnat - *How important is the reproduction technique for the perception of spaciousness in music?*
8. Sami Tynys - *"Music in mental hospital" - Historical perspectives on the use of music and music therapy in Finnish psychiatric hospitals*
9. Pingli Wang - *The Quartet Theory of Human Emotions and the Human Sadness System compared: Music-evoked sadness and joy*
10. Olivia Xin Wen - *Isomorphism of pitch and time*

Workshops

A number of workshops will be offered in parallel sessions on the 9th of June. These will be short, introductory sessions, lasting an hour and a half. They will each cover a practical technique which may be used in music research, therapy, performance or education. There are six to choose from, depending on your interests. If you have not already signed up for a workshop online, or you have forgotten which workshop you registered for, please visit the Conference Info Desk.

Title	Description	Instructors	Room
Motion Capture	A practical session in recording human movement, just like in the movies!	Emily Carlson, Joshua Bamford and Susan Johnson	M014 (MoCap Lab)
Music Information Retrieval	An introduction to using the MIRToolbox in MATLAB for musical analysis	Pasi Saari and Martin Hartmann	M210 (Computer Lab)
Music Technology / Music Tower	Showcase of new musical learning environments	Mikko Myllykoski	M015 (Studio)
Heart-rate Variability	Recording a heart beat is easier than ever, and this workshop will explore some possible research applications.	Olivier Brabant and Felix Loß	M307
Vibroacoustic Therapy	Good Vibrations: Exposure to low-frequency sound vibration in therapeutic settings.	Elsa Campbell	M006 (Clinic 2)
Active Music Therapy	Participate in some group music making, with a discussion of the principles behind Music Therapy.	Zsuzsa Földes and Maria-Eleni Salta	M103

Social Programme

Conferences shouldn't all be hard work. In the evenings we will have a range of social events to help us all get acquainted with the city and each other. We hope to be able to offer you some typically Finnish experiences during your short stay.

Tuesday	For those who arrive early, or who take part in the satellite event on the 7th of June, there will be an informal city tour and social get-together. Meet in front of Musica at 19:00.
Wednesday	Welcoming party (with a surprise). We'll start in M106/Boombox at 19:00.
Thursday	Conference Dinner. Meet outside Musica at after the conference ends for the day. We will take the bus to a top secret location for a dinner with lake views. Busses will leave at 18:00. Don't be late, the bus will not wait!
Friday	Open Stage. In an effort to prove that musicologists can also be musicians, we will have a talent night and jam session in M106/Boombox at 19:00. Standard band instruments (piano, guitar, drums) will be available to borrow. Afterwards, we can go out for some traditional Finnish karaoke.
Saturday	Afternoon on an island. Sauna and swimming on Lehtisaari island to recover from the week. The boat to Lehtisaari is free, and travels to the island every hour on the hour. We leave at 12:30 from outside Rentukka, to get the 13:00 boat.

Boats on Tuomiojärvi. Photo by Susan Johnson

General information

Conference Info Desk

The Conference Info Desk is located at the lobby of the Music Department (to the right of the entrance).

Opening hours:
Tue, June 7, 17:00-19:00
Wed, June 8, 8:00-19:00
Thu, June 9, 8:00-18:00
Fri, June 10, 8:00-19:00

In very urgent cases, call: +358 41 369 7130

Registration

All participants must register onsite at the Conference Info Desk in order to receive their conference pack, including the name badge that permits access to all scientific sessions and social events.

Badges

All delegates will receive a badge upon registration. The badge permits access to all scientific sessions and social events, so it should be worn all times. It is also a nice way to remember each other's names.

Badge/Lanyard colour code:
    Blue - Delegates
    Orange - Organising Committee

Lunch and Tea/Coffee Breaks

Lunches and light refreshments are included in the conference fee. Lunches are served at the university restaurant Tilia (T). For the location of Tilia and other restaurants and cafes around campus check the map on the back cover of this book. Tea, coffee and biscuits will be served twice a day, in the morning and in the afternoon, in M106 (Boombox).

Transportation

Visit the Conference Info Desk to obtain information on public transport and taxis. We do not provide daily transportation from the accommodation to the conference venue.

Messages and Programme Changes

All messages and any programme changes will be posted at the Conference Info Desk.

Internet

The University of Jyväskylä is part of the Eduroam network, so if your institute offers Eduroam access (https://www.eduroam.org), you can use this network. Others please use the "jyu-guest" network – vouchers for the network will be provided upon registration.

Technical Assistance

There is technical assistance available during the conference. Please contact the Conference Info Desk or find a member of the Organising Committee.

Foreign Exchange and Banking

All banks have offices on the main street running through the centre of Jyväskylä (Kauppakatu), and are open Monday to Friday, 10:00 to 16:00. Most international credit cards (Visa, MasterCard, EuroCard, American Express) are accepted in shops, hotels, and restaurants. ATMs ("Otto" in Finnish) can be found in Kauppakatu, as well as in the railway station and at the K-markets on the way to the Kortepohja student village.

Health Service

Emergency health care is available at the Central Hospital (Address: Keskussairaalantie 19). For help with first aid, please contact the Conference Info Desk (or a member of the Organising Committee). The emergency number in Finland is 112. Local pharmacies ("Apteekki") sell prescription-free drugs and remedies.

Tourist Information

The City's Tourist Information Office is located in the shopping centre Forum, 2nd floor, Asemakatu 7 (open Monday to Friday, 10:00 to 17:00). Staff there can provide information on events in the city and the surrounding region (movies, museums, exhibitions, concerts, etc.). Information about Jyväskylä is also available online at http://visitjyvaskyla.fi/en, or by calling +358 14 266 0113.

Postal Service

The main post office is on Vapaudenkatu 48-50 (open Monday to Friday, 8:00-20:00). Post boxes can be found in the city, the closest being located at the University Library. Stamps can be bought in R-Kioski and Soppi (the university shop)

Smoking

In Finland, smoking is generally forbidden in public areas, including restaurants, bars, and coffee shops. It is further not permitted to smoke on the University campus, except in designated smoking areas. Please obey NO SMOKING signs as a matter of courtesy.

Instructions for Presenters

Here are specific instructions for all presenters and chairs. Please note: all spoken and poster presentations must be given in English.

Paper presentations

The presentation rooms are equipped with a computer, data projector and sound system. To avoid unnecessary formatting and compatibility issues, we recommend that presenters use their own laptop or tablet, which can be connected to our projector system. Please bring any VGA, DVI, HDMI, or other adaptors to connect your device to the data projector, if needed.

If presenting from your own device is not possible, presenters may also choose to upload their presentations to Dropbox and share them with sysmus2016@gmail.com. It is recommended that presenters keep a backup copy of their presentation on a USB stick, and consider e-mailing themselves a copy of their presentation before travelling to the conference.

Please arrive at your designated presentation room at least 15 minutes before the session is scheduled to start (e.g., in the beginning of the break before the session starts). Introduce yourself to the session chair and check that your presentation works.

Spoken presentations should last 20 minutes and will be followed by 8 minutes for discussion. Please practise your presentation before the conference to insure that it does not last longer than 20 minutes, as going over your allocated time will not be allowed.

Poster presentations

Posters should be no bigger than size DIN A0 (84 x 119 cm) if portrait orientation, and no bigger than DIN A1 (59 x 84 cm) if landscape orientation.

Speed poster presentation will consist of four minute spoken presentations by each presenter giving an overview of their poster contents, followed by a one hour discussion time during which presenters can answer questions at their individual poster locations. Speed poster presentations should be given using Powerpoint. Please send your slides ahead of time to sysmus2016@gmail.com. We will compile them into a single, ordered presentation to avoid having to switch devices between speakers.

Posters will be located on the ground floor of the Musica building. Presenters will be assigned a number, and must hang and remove their own posters at the corresponding display board. Posters from the first session can be hung starting from the evening of Tuesday, June 7th, and must be removed by noon on Thursday, June 9th. After Thursday noon, posters for the second session can be hung. Poster hanging materials will be available from the Conference Info Desk. There will be members from the Organising Committee to assist you.

Instructions for Chairs

The chair should briefly introduce each presenter, giving the audience the presenter's name, university affiliation, and field of study. Chairs should speak briefly with presenters before the start of the session to confirm these details.

The chair is responsible for ensuring that the session runs on time. Use an accurate time-keeping device, such as a stopwatch feature on a smartphone, to keep track of time during each presentation. Signal presenters when they are nearing the end of their alloted time, for example by raising your hand when there are five minutes remaining. Agree with the presenters ahead of time what the signals will be and when they will be given. If a presenter continues beyond their alotted time, the chair may tell the speaker that they must stop there.

After the presentation, the chair should ask the audience if there are any questions. If there are multiple questions, the chair decides the order in which they are asked. In case there are no questions, the chair should themselves have one or two questions prepared for the presenter. The chair may also moderate questions from the audience, for example asking that a question be stated briefly as possible. The chair should end the discussion when time as run out, and conclude by thanking the presenter.

Conference Etiquette Guide

As this may be the first conference for many of the delegates here, we decided to provide some handy tips to getting the most out of your conference experience.
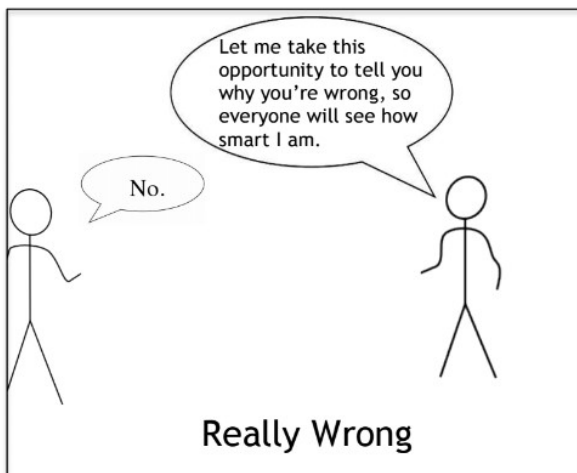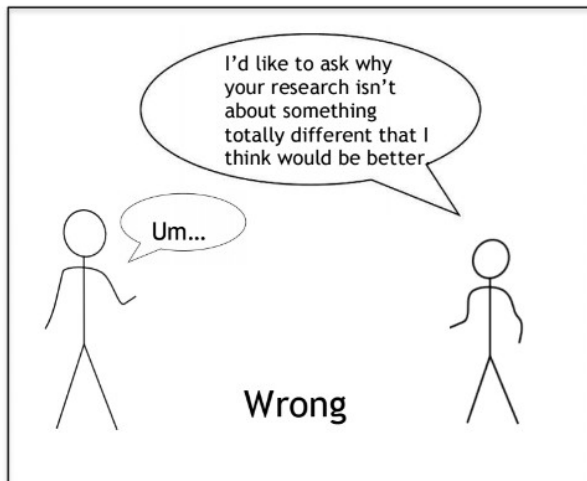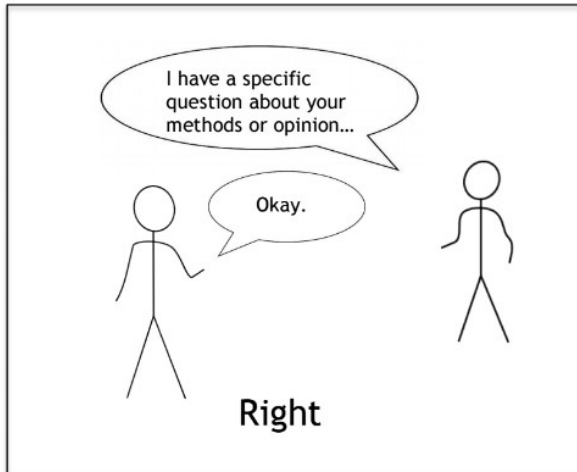
Questions and Comments

The few minutes of discussion time following presentations can be one of the most interesting and enjoyable parts of a conference, but they can also be some of the most cringe-worthy when poor conference etiquette appears. Here are some tips to avoid causing anyone to roll their eyes when you respond to someone's presentation:

DO:
- Thank the presenter for their talk
- Compliment what you liked
- Seek clarification
- Be as specific as possible
- Keep your comments short
- Offer constructive suggestions
- Be respectful
- Focus on the work at hand

DON'T:
- Ask about the beginning of the presentation if you were late
- Criticise harshly
- Use the entire discussion time with one very long comment or question
- Ask off-topic questions
- Talk mainly about yourself

REMEMBER:
- This is not the right time to show off your own knowledge
- Discussing ideas is more productive than pointing out mistakes
- Questions, comments and ideas can always be brought up in private conversation with the presenter after the session is over

Presenting Your Work

The chance to present your work to peers is one of the most important reasons for attending a conference. Remembering some good presentation etiquette can make your talk more engaging and enjoyable for everyone.

DO:
- Double check sound and video elements beforehand
- Look up and make eye contact with your audience
- Avoid jargon and colloquial expressions
- Speed up or skip ahead if you are running out of time
- Thank your audience for their time and attention

DON'T:
- Go over your allotted time

REMEMBER:
- There will never be enough time to cover all of the relevant information, so choose carefully what you wish to highlight
- If you sound bored reading it, your audience is probably bored listening to it
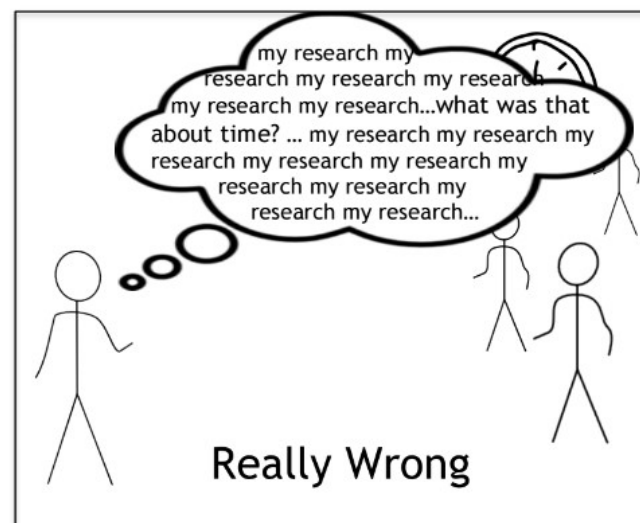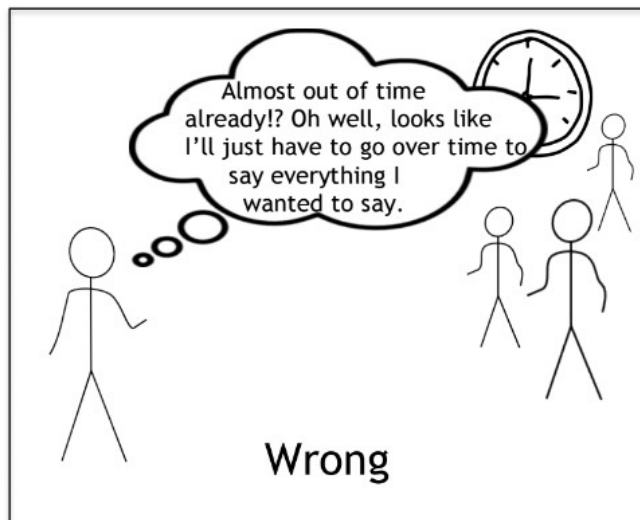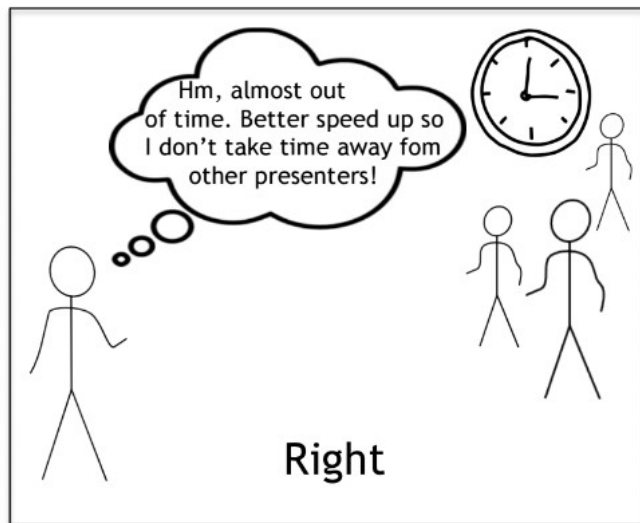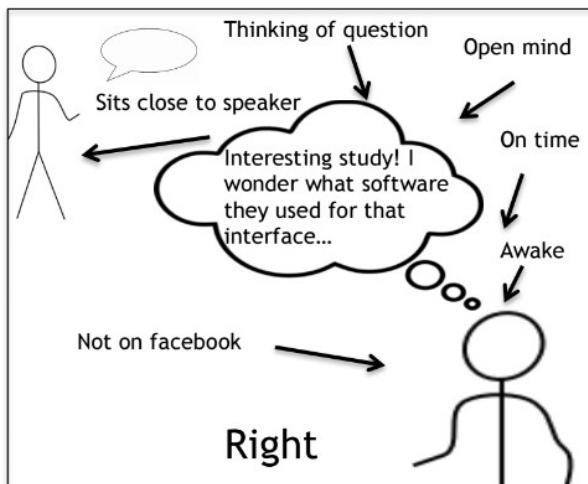
General Etiquette

Even when you are not presenting or taking part in public discussion time, there are still important etiquette principles to keep in mind that will help keep the conference running smoothly.

DO:
- Come back from coffee and lunch breaks on time
- Make an effort to attend all sessions
- Be respectful and attentive during other's presentations

DON'T:
- Look at Facebook during sessions
- Write your own presentation during others' presentations

REMEMBER:
- You get out of the conference what you put into it, so try to make the best of your (and everyone else's) time
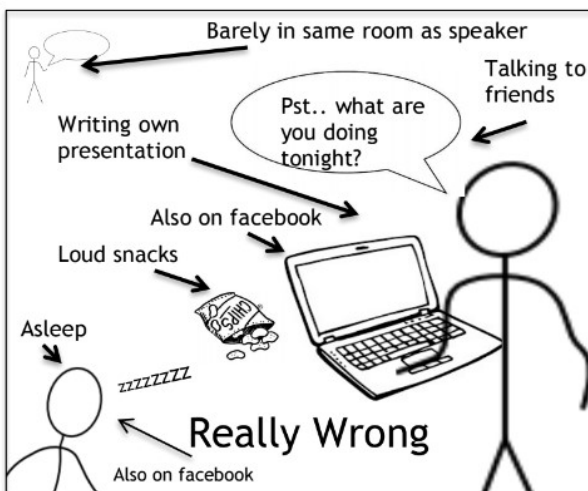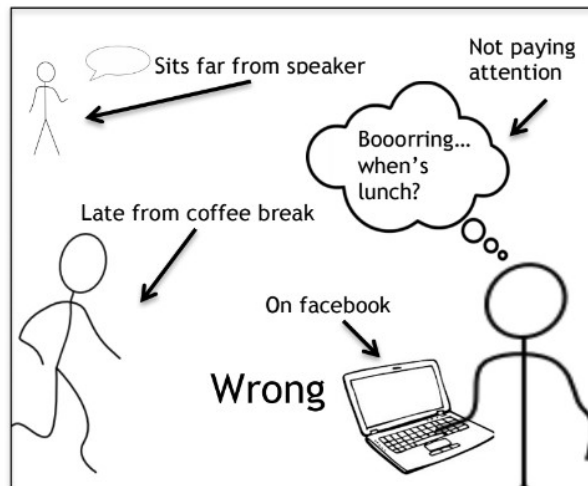
Useful Finnish Words and Phrases

When travelling in Finland, most of the signs will be in Finnish and Swedish, and only rarely in English. Here are a few useful words you might need while travelling in Finland.

Finns tend to add more letters into words or change the endings instead of little words like "in", "to", "for" or the like, so never mind if the words look slightly different!

Everyday Words

Kiitos	Thank you
Moi/Hei	Hi
Moi moi	Bye
Tervetuloa	Welcome
Puhutko englantia?	Do you speak English?
En puhu suomea.	I don't speak Finnish.
Anteeksi!	Sorry!

Travel Words

Asema	Station
Rautatieasema	Railway station
Juna	Train
Kaukojunat	Long-distance trains
Kaukoliikenne	Long-distance transport
Lähijunat	Local trains
Laituri	Platform
Linja-auto, linkki, bussi	Bus
Pysäkki	Bus stop
Lähtöaika	Departure time

Jyväskylä Words

Keskusta	City centre
Kompassi	The compass. An intersection in the pedestrian mall in the city centre, and popular meeting place.
Kortepohja	The part of town where the student village is located.
Majoitus	Accommodation
Opiskelija	Student
Seminaarinmäki	The university campus where the Department of Music is located.
Yliopisto	University

Abstracts

Aspects of music in medicine

Ralph Spintge

Sportklinik Hellersen, Lüdenscheid, Germany; University of Music and Drama HfMT Hamburg, Germany

As long as human civilisation does exist music is produced, consumed and used not only for aesthetic purposes, but also for healing purposes. Nowadays socalled medicofunctional music comprises musical stimuli intentionally designed and used as therapeutic agent in traditional medical settings, based on evidence from research following scientific standards accepted by medical communities around the world. While in earlier studies research focused on therapeutic effects, recent studies even include socioeconomic outcome parameters. Anxioalgolytic Music used against pain and stress will be described as an example of how such research is conducted and what significant effects do occur.

Dr med. Ralph Spintge is the director of the Regional Pain Centre DGS at Sportklinik Hellersen, Lüdenscheid, Germany. He is Board Certified for Anesthesiology, Pain medicine and Occupational Health, Lifetime Professor for Music Medicine and lecturer within the Music Therapy Master Course at the Institute for Music Therapy a the University of Music and Drama, Hamburg. Beginning in 1977 Spintge conducted a series of psychophysiological studies about the anxioalgolytic effects of music in Surgery, Anaesthesia, Pain Therapy, Obstetrics, and Dentistry at various institutions around the world. He was co-investigator within a 10-year research programme on "Rhythmicity, Heart Rate Variability and Cardiorespiratory Variability: The Neurovegetative Status in Man" in co-operation with the German Max-Planck-Society, based on a grant from Sporthilfe e.V.

His current research focuses on the impact of medicofunctional music on Heart Rate Variability in chronic pain. Spintge's publications comprise numerous articles and 22 books about innovations in anaesthesia and pain medicine, as well as applications of medicofunctional music. He is a founding member (1982) and currently President of the International Society for Music in Medicine (ISMM), honorary member of The International Association for Music and Medicine (IAMM), member of the International Association for the Study of Pain (IASP), the German Society for Medical Psychology, and an honorary member of the Music Therapy Association of Catalonia/Spain.

Music in our life: Learning and re-learning

Mari Tervaniemi

University of Helsinki, Finland

During past few decades, our knowledge about the brain functions and structures underlying music perception, performance, and emotions has accumulated relatively fast. However, much less is known about the brain determinants underlying music learning and music therapy. In the present talk, I will introduce data revealing the impact of music learning on brain functions in fetuses, toddlers and school-aged children. Furthermore, I will show results about music rehabilitation obtained from dementia patients and from other neurological patients. These very recent data indicate that music-related activities, even in terms of singing and listening to familiar songs, can effectively boost the emotional and cognitive well-being of the patients as well as their caregivers.

Prof. Mari Tervaniemi is a well-known expert in neurosciences of music. She obtained her PhD in psychology in 1997 (University of Helsinki). In addition to University of Helsinki, she has worked at the University of Jyväskylä as a professor and in Leipzig as a visiting Marie Curie fellow at the University of Leipzig in close collaboration with the researchers at the MPI for Human Cognitive and Brain Sciences. Currently she is the co-head of Cognitive Brain Research Unit, the head of Brain and Music team, and research director in the Cicero Learning network.

Prof. Tervaniemi has published about 150 empirical papers and reviews in peer-reviewed international journals and several invited book chapters. Her research topics cover auditory neurocognition as well as the brain basis of musical expertise and music emotions. Of particular interest to her is to apply knowledge acquired within the framework of basic science into rehabilitation, education, and special education. For further information, see www.cbru.helsinki.fi/music.

What *is* musical tempo?

Justin London

Carleton College, Northfield, USA

When we listen to music its tempo is rarely, if ever, in doubt. Within just a few seconds, we know whether the music is fast, moderate, or slow. Yet the cues for these judgments are not simple or straightforward. This presentation will begin with a few illustrative examples, which we will then unpack in terms of their beat rate, loudness, event density, and spectral flux. The effect of familiarity with the music (and musical style) will then be considered. Moving beyond auditory cues, the effect of watching others moving while listening, as well as one's own movement while listening, will be added to the picture, showing that tempo perception has important cross-modal aspects. Finally, and perhaps as a way of untangling the Gordian knot of the auditory, visual, and kinesthetic cues for tempo, an energistic account of tempo is given, suggesting that "tempo" is not so much a measure of musical speed, but rather an index of the energy required to produce and/or move with the music.

Justin London is Professor of Music at Carleton College in Northfield, MN, where he teaches courses in Music Theory, Music Psychology, Cognitive Science, and American Popular Music. He received his B.M. degree in Classical Guitar and his M.M. degree in Music Theory from the Cincinnati College-Conservatory of Music, and he holds a Ph.D. in Music History and Theory from the University of Pennsylvania, where he worked with Leonard Meyer. He has published widely in music theory, music perception and cognition, and musical aesthetics. His current research is on micro-timing in the complex rhythms found in Malian drumming (with Rainer Polak of the Max Planck Institute for Empirical Aesthetics, Frankfurt, and Nori Jacoby of MIT) and on the cross-modal perception of musical tempo (with Petri Toiviainen of the University of Jyväskylä). Professor London was co-director of the 2005 Mannes Institute for Advanced Studies in Music Theory on Rhythm and Temporality and in 2012 he served as co-chair of the Interdisciplinary College (IK) for cognitive science in Günne, Germany. He has held two Fulbright Fellowships, in 2005-2006 at University of Cambridge in 2014 at the University of Jyväskylä. He served President of the Society for Music Theory in 2007-2009, and is President-elect of the Society for Music Perception and Cognition.

A journey to ecstasy: The lived experiences of electronic dance music festival attendees

Noah Little, Birgitta Burger

University of Jyväskylä, Finland

Recently, there has been a growing global phenomenon of electronic dance music festivals. Worldrenowned electronic dance music festivals including Belgium's Tomorrowland, U.K's Creamfields, and Miami's Ultra Music Festival, are newly experiencing a drastic influx of festival attendance, societal acceptance, and media coverage. Previously, music festival investigations have primarily focused on motivational factors of attendance, drug incidence, and event management techniques. However, contemporary research has determined attendees are obtaining both psychological and social benefits from these music festivals. This study aimed to provide a detailed exploration of the lived experiences of individuals who attended a multi-day electronic dance music festival and was primarily interested in the perceived beneficial changes within the individual, following their festival experience. A semistructured qualitative interview was used to collect data from 12 individuals who attended the 2015 Electronic Daisy Carnival in Las Vegas. The data was analysed using thematic analysis. Within the data emerged the following themes: 1) motivation to attend 2) drug use and abstinence 3) festival atmosphere 4) positive social interactions 5) sense of community 6) perceived beneficial changes. We discovered that individuals believed the festival to be a spiritual-like experience that was sacred and personally meaningful to them. As well, the majority of participants reported abstinence (alcohol, illicit drugs) during their festival experience. Interestingly, following the festival, participants reported the adoption of new values including a greater respect and acceptance for others, the desire to improve themselves, and reduced anxiety. These findings add to the existing body of music festival literature, further contextualizing how music festivals are both experienced, and reflected upon by individuals.

Keywords: benefits, changes, festival, interaction, social

Paradigms in the compositional practice of Irish singer-songwriters

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The singer-songwriter has emerged as a significant figure in contemporary Irish culture. Ireland's monumental history in musical practice has cultivated some of the most internationally respected singer-songwriters of recent decades. While much research has been devoted to the songs of Irish artists at large, little attention has been allocated to demystifying their songwriting praxis. The present work critically examines the relationship between the Irish singer-songwriter and wider mediated discourses surrounding their artistry. Independent of genre it interrogates the compositional practices of performing songwriters by way of phenomenological study. Specifically, the lived experience of Irish singer-songwriters is explored and evaluated through in-depth interviews, and consideration of artefacts including song texts and recordings. Tracing the most important sources of their creativity it is evident that while some practitioners are largely influenced by indigenous Irish folk music many are predisposed to multicultural traditions. Whilst experiences are unique to individual singer-songwriters many share similar complexities in attempting to migrate from conventional praxis. It is evident that limitations frequently provide artistic definition, thereby safeguarding the practitioner's aesthetic. Accession of an individual voice presents an interesting conundrum for a twenty first century singersongwriter as the emphasis of a traditional culture is by nature, not individually focused. It is concluded that while a grounded musical tradition may certainly be viewed as a privilege, much of the Irish singersongwriter's labour involves conscious effort in re-encoding their work.

Keywords: Irish, practice, culture, phenomenology, singer-songwriter

Does excessive practicing have addiction potential?

Christine Ahrends

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As an explanation for music students' great amounts of practice hours Panksepp suggests "musical addiction", reasoning that activation of the reward center in other activities can lead to behavioral addiction. Indeed, recent studies from the domain of otolaryngology support the idea of behavioral addiction concerning music consumption. However, there has not been any research on the transferability of these findings to performing/practicing of music so far. Evidence shows that in some cases excessive practicing lacks self-control (e.g. by continuing practice through practice-induced pain), and when deprived of practicing, psychosomatic disorders (headaches, nightmares,insomnia, anxiety attacks etc.) have been reported, thus transforming a former expedient behavior into a maladaptive or even self-injurious one.

This study is conceived as a pre-study to give plausible reasons for or against the assumption of "musical addiction" and to suggest a description of possible symptoms.

At first, a theoretical part reflects on neurobiological and psychological conditions of both music practicing and behavioral addiction to reveal similarities. Based on the designs of the above mentioned studies and research on other forms of behavioral addiction (such as gambling disorder, sports addiction etc.) a questionnaire using Brown's six criteria of addiction is being developed and executed to provide evidence about symptoms of the phenomenon in question. In a next step, qualitative interviews with those subjects scoring the highest in the first part reveal additional symptoms or modifications to improve the questionnaire for further research. Finally, suggestions on studies to properly define the phenomenon and its prevalence among musicians are made based on the findings.

Despite theory supporting the assumption of an addictive character of excessive practicing, it seems unhelpful to pathologize this behavior until a clinical relevance has been proven in contrast to other rewarding activities. Interpretations should rather focus on self-injurious actions among musicians expressed by practice habits.

Keywords: self-injurious behavior, addiction, practice, reward system

Does empowering music enhance performance and risk-behavior in sports?

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It is a common belief that music enhances sport performance and promotes self-esteem in athletes. n sports, music has been used to bring people in the right mindset prior to competitions, helping them to reach the peak of their confidence levels. But does this effect stand firm of scientific scrutiny? And what potential factors might explain an enhancing effect?

To this end the aim was to test whether motivational music improves sport performance and promotes risky behavior in sport settings. It was hypothesised that the effect of listening to motivational music is mediated by an enhancement of state self-esteem and a decrease in performance anxiety. It was further assumed that self-selected motivational music would have a greater effect on both outcome variables as compared to experimenter-selected motivational music. The study design requires participants to throw a ball into a funnel basket in multiple trials from various distances. While the hitting rate from fixed distances serves as a measure for the throwing performance, risk-behavior is assessed in trials were participants chose distances themselves. Participants were randomly assigned to one of the three experimental groups. The first group listened to self-selected music, the second to experimenter-selected music, and the third served as control group with no music.

At the time of abstract submission the experiment is being conducted in the laboratory of the Max Planck Institute for Empirical Aesthetics. Data collection is expected to be completed by the end of February.

Keywords: self-esteem, affectivity, empowering music, exercise

Are we dancing to the same beat? Empathy and interpersonal synchronisation in the silent disco

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Previous 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 the Big Five. One of each pair hears the original track, while their partner hears it either: unchanged (the synchronised condition), time-shifted by a quarter beat, or with a slightly stretched tempo. Subjective measures of enjoyment and affiliation were used to compare conditions, revealing that pairs subjectively rated their interaction as better when in the synchronised condition, although there was no effect on subjective enjoyment. Three styles of coping with asynchrony were observed, and these may be explained by personality differences. Furthermore, an association was observed between the Agreeableness trait and giving a positive rating to partner interaction in the Synchronised condition, indicating that high Agreeableness may predispose one to be more attuned to interpersonal synchrony. This study may provide new insights into the role of synchronisation in social dancing as it suggests that shared experiences create a greater sense of affiliation when shared in time.

Keywords: silent disco, empathy, music and movement, dance, entrainment

Embodied rhythm perception: The effect of head movement on rhythm reproduction

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This decade has seen an increase in studies investigating how listeners' body movement might affect their perception of musical time. Previous studies have tended to focus on the relationship between movement and the sense of the metrical structure while the perception of rhythm is still in need of further investigation. This paper examines the influence of active head movement on rhythm reproduction involving the perception and memory of rhythms and discusses the factors which may affect participants' ability to reproduce rhythms, such as their backgrounds, and the strategies they adopted to accomplish the tasks. An experiment of two tasks was conducted – a rhythm reproduction task followed by a drawing task which intended to understand how participants realise rhythms. Stimuli used in the reproduction tasks were 35 rhythms from Shmulevich & Povel's (2000) rhythm complexity table and those used in the drawing tasks were 9 rhythms from Smith et al.'s (1994) study on rhythm understanding. All 21 participants were instructed to accomplish both tasks under two conditions – move-head and no-move. The results revealed that despite the fact that most participants claimed they felt more confident in their answers in the no-move condition, they reproduced the rhythms more precisely in the move-head condition regardless of which strategy they took and what music training they had received ($F(1,13)=8.032$, $p=0.014$). The drawings showed that most participants seemed to adopt a combination of metric and figural strategies to understand rhythms and head movement could affect the methods they adopted. To conclude, onbeat head movement can assist participants to reproduce rhythms better and may serve the function of error detection which enabled the participants to be more aware of the mistakes they made.

Keywords: rhythm reproduction, memory, body movement, vestibular stimulation, rhythm drawing

Musical feedback: A new strategy in gait training for Parkinson's Disease patients

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Rhythmic auditory stimulation (RAS) for gait training in Parkinson's disease has been applied successfully over the last three decades. The available literature supports its effectiveness systematically (e.g. Thaut 1996, Benoit 2014, Mainka 2015).

The purpose of this study is to investigate the effectiveness of an extended concept of RAS which is not limited to musical stimulation, but also includes musical feedback, which to date has not been investigated in Parkinson gait training.

In our study the comparison between RAS, musical feedback (MF), and no musical stimulation (NM) is conducted on a sample of 20 idiopathic Parkinsonian patients in a randomised cross-over design. Each patient has the task to walk for six minutes for each condition, focusing on stride length. He is instructed to make long steps and is connected with a software that is able to record stride length and cadence. In the RAS condition the patient listens to music with clearly accentuated rhythm. In the MF condition, as the stride length increases, the same musical piece used in the RAS condition goes through five different levels, ranging from a simple beat to a complete orchestral sound. The software records in which percentage every music level is covered, with higher levels corresponding to longer strides.

The study is still in progress, but our preliminary results confirm the expectation that MF facilitates stride length increase in a faster and more stable way than RAS does.

The reaction of the patient is fast, goal-directed and, most importantly, continuously encouraged by the musical feedback. These features make the gait training with musical feedback significantly different from and possibly more effective than classical RAS. Our results encourage further research on the role of musical feedback as a therapeutic device.

Keywords: Parkinson's, musical feedback, gait training, RAS

Sounds within reach: Enriched Environments for Physical Rehabilitation

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Background

Digital approaches to physical rehabilitation are becoming increasingly common and embedding these new technologies within a musical framework may be particularly motivating. Stroke survivors often receive little formal support to help with physical or psychosocial problems and are at considerable risk of incurring a secondary stroke. The challenge, therefore, is to offer stroke survivors a motivating framework for initiating and repeating specific physical exercises.

Study 1: Can Specialised Electronic Musical Instruments Aid Stroke Rehabilitation?

The exploratory study (Kirk, 2015) recruited stroke survivors (n = 43) from local community groups in London, between 6 months and 19 years post-stroke. All participants attended specially designed workshops playing music, both in groups and individually, using a number of digital musical interfaces (DMIs). Feedback forms were completed by all participants, which helped to develop the prototypes and gain insights into the potential benefits of music-making for rehabilitation. 93% of participants stated they thought that the music workshops were potentially beneficial for their rehabilitation.

Study 2: Motivating Stroke Rehabilitation through Music: A Feasibility Study Using Digital Musical Instruments in the Home

The feasibility study (Kirk et al, in press) aimed to test if DMIs could aid in the self-management of stroke rehabilitation in the home, focusing on seated forward reach movements of the upper limb. Participants (n=3), all at least 11 months post stroke, participated in 15 researcher-led music making sessions over a 5 week intervention period. The sessions involved them 'drumming' to the beat of self-chosen tunes using bespoke digital drum pads that were synced wirelessly to an iPad App and triggered percussion sounds as feedback. They were encouraged to continue these exerciseswhen the researcher was not present. The results showed significant levels of self-management and significant increases in functional measures with some evidence for transfer into tasks of daily living.

Keywords: entrainment, self-managment, stroke rehabilitation, music therapy, digital musical interfaces

Music Performance Anxiety: Can observers perceive anxiety in the performer?

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Music Performance Anxiety (MPA) is known to affect musicians at different levels. Recent studies have shown that anxiety can induce changes in body movements, and that body movements could affect perceiving intended emotions of a music performance. It has been shown that individuals are able to perceive differences between intended emotions and the performer's felt emotions during a musical performance. However, it remains unclear whether different modalities (audiovisual, audioonly & video-only) will elicit differing responses in perceived anxiety. The present study aims to investigate whether MPA can be perceived in a musical performance under different modalities, and whether perceived anxiety ratings would be affected by the level of music expertise. Eight performers (5 pianists & 3 singers) completed the revised Kenny Music Performance Anxiety Inventory (K-MPAI). The performers were also videotaped and audio-recorded performing a repertoire of their choice in the presence and absence of an audience. Excerpts of the performances were presented to two groups of evaluator (N = 53) in three modalities. Evaluators were asked to rate the excerpts in terms of the performer's inner state in a 7-point Likert scale. The results showed that the high-anxious performers were rated as being more anxious when visual cues were available, while the low-anxious performers were perceived as more anxious when visual cues became unavailable. It was also revealed that the evaluators rated the performers as more anxious when they performed in presence of an audience. The finding of this study helps us to understand the importance of visual cues in assessing anxiety in the performer. The results also provide practical implications for online and blind auditions.

Keywords: music performance anxiety, music perception, felt emotion

Expressive performance and listeners' decoding of performed emotions: A multi-lab replication and extension

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Until recently, there has been a lack of replication studies conducted in the field of music psychology. A highly-cited paper in the field by Juslin and Gabrielsson (1996) reported that performer's intended emotional expressions were decoded by listeners with a high degree of accuracy. While there have been related studies published on this topic, there has yet to be a direct replication of this paper. The present experiment joins the recent replication effort by producing a multi-lab replication using the original methodology of Juslin and Gabrielsson. Expressive performances of various emotions (e.g., happy, sad, angry, etc.) by professional musicians were recorded using the same melodies from the original study and are subsequently being presented to participants for emotional decoding (i.e., participants will rate the emotional quality of each excerpt using a 0-10 scale). The same instruments from the original study have been used (i.e., violin, voice, and flute), with the addition of piano. Furthermore, this experiment investigates potential factors (e.g., musicality, emotional intelligence, emotional contagion) that might explain individual differences in the decoding process. Finally, acoustic features in the recordings will be analysed post-hoc to assess which musical features contribute to the effective communication of emotions. The results of the acoustic and individual differences analyses will contribute to a more comprehensive understanding of when music can be an effective vehicle for emotional expression.

Keywords: listening, emotional decoding, multi-lab, replication, performance

Becoming and being a musician

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Studies comparing musically trained and untrained children and adults provide evidence of short and long term structural, functional and behavioural changes associated with experience-specific adaptation within the cortical and subcortical sensory-motor neural networks. Researchers have suggested that changes associated with musical learning may transfer to near (fine motor ability) and/ or far (general intelligence) domains. However, few studies have considered the concomitant development of a range of cognitive, behavioural and socio-emotional measures reflecting emerging musicianship. Two studies are presented here; firstly a quantitative longitudinal quasi-experimental investigation of multiple measures of musicianship. Over one academic year, 19 children received < 1 hour per week of statutory school music group lessons, and 19 children self-selected > 1 hour additional extracurricular musical instrument lessons for the first time over that year. A battery of tests included measures of intelligence, memory, motor abilities and parental and teacher reports of clinical and adaptive social and emotional behaviours. Results showed musical training enhanced hand-eye coordination and fluid intelligence (matrix reasoning subtest), replicating and extending previous studies. In order to better understand how these effects may be realised and experienced in established musicians, a second qualitative grounded theory study included 28 interviews with non-conformist and popular musicians as well as conductors and music producers. They reflected upon what it is to be a musician, and what qualities they were aware their experiences had brought to their lives. A musicians' model of musicianship emerged which challenges assumptions relating to the linearity of the concept of transfer effects. The data generates new hypotheses that musical learning supports and encourages flexible cognitive and behavioural skills that are further enhanced by the concomitant experience of nonverbal communications encompassing music and socialisation. Through the process of becoming, and the nature of being, this model suggests there is an ontology of musicians.

Keywords: socio-emotional, transfer, behavioural, musician, cognitive

The structure of absolute pitch abilities and its relationship to musical sophistication

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Two types of absolute pitch abilities have been identified from previous research: overt AP (e.g. Pitch labelling; oAP) is purported to be a rare binary ability possessed by a small proportion of people with a musical background, while latent AP (recognising or producing a well-known song at the correct pitch; lAP) is thought to exist in the general population and can be measured on a continuous scale. However, the measurement structure of these abilities (binary versus continuous) and the degree to which the two are related still needs to be confirmed. Furthermore, it may be that lAP is merely a sideeffect of singing ability, musical engagement, or formal musical training. The relationship between lAP and musical sophistication thus requires clarification. We therefore developed of a comprehensive test battery for measuring oAP and lAP in musicians and non-musicians to address the aforementioned questions. 104 musician and non-musician participants were tested on five oAP and three lAP pitch production and perception tests, as well as three subscales of the Goldsmiths Musical Sophistication Index self-report inventory. In a preliminary analysis, Gaussian mixture modelling showed oAP scores to be bimodal and lAP to be unimodally distributed. Variable selection for cluster discrimination and exploratory factor analysis suggested different pitch production tests as the most efficient measures of latent oAP and lAP abilities. A point-biserial correlation indicated a relationship between overall oAP and lAP scores, but this relationship was not found when participants with and without oAP were analysed as separate groups. There was no significant correlation between lAP scores and active engagement, musical training or singing ability. These results support previous findings that oAP is a binary ability and indicate that lAP is a continuously expressed ability which is distinct from oAP. Results further show that lAP is not a mere side-effect of musical sophistication.

Keywords: pitch memory, pitch perception, absolute pitch, musical sophistication, psychometrics

Neural correlates of flow state in musicians

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Flow state is an extremely focused state of consciousness which occurs during intense engagement in an activity during which people typically experience feelings of intense pleasure and happiness, usually while performing at their peak. This study is the first of its kind in using EEG to examineneural activity in musicians experiencing flow. This is an exploratory study, the first part of which investigated factors predicting dispositional flow in musicians while the second examined if flow has neural correlates measurable with EEG.

48 musicians answered surveys on personality, emotional intelligence, musical sophistication and flow experience. Their scores were then correlated. Musicians also had their EEG data recorded while they self-induced flow by playing pieces that reliably put them into flow state and as a control, played music that did not induce flow state for them.

Musical sophistication, as measured by the Goldsmiths Musical Sophistication Index, was positively correlated with dispositional flow. The resting state EEG immediately after performance showed significant differences between the two conditions, particularly in the frontal areas. The state after experiencing flow had lower delta (1-4 Hz) power, higher upper alpha (10-12 Hz) power and higher beta (15-30 Hz) power than the state after not experiencing flow. Connectivity analysis shows a right frontal electrode cluster driving parietal and occipital electrodes in the state after flow but not non-flow. However, this pattern of activity was only present in participants with high dispositional flow. This suggests that it is possibly an important region of interest in flow state.

The results show some support for Dietrich's theory of flow as transient hypofrontality but more importantly, shows that flow has neural correlates measurable with EEG which can be a viable method to study flow in musical performance.

Keywords: musicians, EEG, flow, musical performance

Cerebral electrical activity triggered by music imagery and music perception: A comparative EEG study

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This study constitutes a pilot protocol designed to gather preliminary information regarding electrical activity triggered by music imagery. The aim of the main study is to obtain evidence of the efferent activation from the auditory cortex on the cochlea. A previous research (Pérez-Acosta et al., 2006) showed an effect of musical imagery on spontaneous otoacoustic emissions (SOAEs) providing evidence of an efferent influence from the auditory cortex on the basilar membrane. However, considering a possible temporal delay between cortex activation and cochlear response, it was decided to include EEG recordings and SOAEs measurements at the same time. Nevertheless, taking into account that information obtained through EEG recordings from a complex cognitive task – such as music imagery – is not specific regarding areas and patterns of activation, a pilot study was designed to determine the type of cerebral electrical activity related to music imagery and possible differences or similarities compared to music perception. The study involved 6 subjects, 3 male (guitarists) and 3 female (pianists), with an average age of 27.6 years and 14.6 years of musical experience. A familiar musical tune was chosen (traditional Mexican tune, "Marcha de Zacatecas") and subjects were trained on the task of imagining it. Subjects remained seated and waited for the randomised instruction to appear in the screen, whether to imagine the tune or listen to it while EEG recordings were made using a 64-channel system (10-20). Data are currently being analysed, but considering previous studies alpha rhythms changes from the frontocentral and parietal areas are to be expected. Results obtained from the pilot study are expected to provide some knowledge regarding network connections related to the imagery task that may point out directions that could facilitate their analyses when having information both from the cochlea and EEG gathered at the same time.

Keywords: music imagery, music perception, EEG

Music and language in the brain: Investigating the temporal nature of interaction between melodic and prosodic expectancy

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Music and language are both auditory channels of communication that exist in every known human culture and are assumed to draw on shared neural resources (e.g., Tillmann, 2012). Melody and prosody are comparable features in their dependency on rhythm and pitch changes (Heffner & Slevc, 2015) but so far surprisingly few studies have looked into the cognitive interaction of these two crucial features of music and language (e.g., Zioga, Luft & Bhattacharya, submitted).

The present study aims to investigate the temporal profile of the interaction between melody and prosody in an expectancy-violation paradigm in musicians and non-musicians. In a reaction-time statement-question identification task, participants will focus on the prosody of spoken sentences while passively hearing melodies. The melodies will end with an either expected or unexpected target tone whose onset will temporally precede, coincide or follow the decisive pitch contour change (question/statement) in the sentences. We further include one speech-only control condition.

Following Patel's Shared Syntactic Integration Resource Hypothesis (Patel, 2003), we expect to find interference between music and speech processing that differs in strength depending on the temporal relationship of the music and speech stream (word first versus music first). This would then reveal novel information about the speed of processing in the shared domains. Based on the traininginduced auditory advantages of musicians (Conway, Pisoni, & Kronenberger, 2009), furthermore, we expect musically trained people to answer faster and more precise than non-musicians in the prosodic judgements. Overall, this study will reveal new insights into how music and language processing interact in human auditory perception systems and how musical training can influence language abilities.

Keywords: melody, shared processing, expectancy, prosody

Social inclusion as therapeutic and educational factor within a music therapy setting

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Inclusive approaches for children with special needs are applied in both the fields of music therapy and (music) education. In practice, inclusive music therapy groups consist only of children with special needs, whereas an inclusive kindergarten group for example may consist of typical and non-typical children, but not in an actual therapy setting. Both practices hold explicit benefits for typical and nontypical children, however mutually exclusive of one another.

This study aims to explore the effects of social inclusion in a group consisting of typically and nontypically developing children within a music therapy setting. The focus lay on the therapeutic benefits for the special needs children and the educational benefits for the typical children. Furthermore, the study will outline the possibilities and limitations of the approach, and the implications it offers in the practice of music therapy and music education.

Therefore, a group of three children, including two typically developing girls and one boy diagnosed with Autism Spectrum Disorder (age between 4 and 7 years), received 18 sessions of music therapy. Each session's structure and activities were planned, evaluated, and reorganised through an action research paradigm. The process was video-taped and three of the sessions (beginning, middle-phase, end-phase), will be analysed using a mixed methods approach of quantitative content analysis and qualitative descriptive interpretation analysis. Additionally, interviews of the mothers were taken and will be analysed using qualitative content analysis.

Preliminary results show that the therapy for the boy with autism may have enhanced active pro-social behavior within and outside the therapy sessions, as well as apparently having increased the social skills of the typically developing girls. Furthermore, musical and social goals could be targeted in both therapeutic and educational ways.

Keywords: autism spectrum disorder, social inclusion, group music therapy, special needs, music education

Links between musical and linguistic skills in young pre-schoolers: The role of the home musical environment

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The relationship between music and language has been examined in adults and school-aged children, with many studies associating linguistic advantages with formal musical training. However, the developmental path of early associations between these cognitive domains remains unclear, as relevant research is limited to children older than 3 years and has mainly targeted rhythmic abilities and early reading-related skills. Other linguistic skills crucial for academic achievement such as language structure have been understudied, although this ability has been linked to musical skills in older children (Gordon et al., 2014). Furthermore, the role of the home musical environment for linguistic skills development has been neglected. This research aims to fill these gaps by examining a) the relationship between musical skills, the development of language structure and phonological awareness in 3- and 4-year-old children and, b) the contribution of the home musical environment to linguistic skills.

Participating children completed age-appropriate musical tasks designed ad-hoc for this experiment and standardised measures evaluating the development of language structure, phonological awareness, and general ability. Parents completed self-reports about their musical profile and frequency and type of musical interactions within the family.

Results indicate that young pre-schoolers' musical abilities are linked to both linguistic domains. Musical sophistication of the parents and informal musical interactions in the home appear to be associated with language development, even when parental education is accounted for.

This investigation sheds light on the developmental path of the associations between linguistic and musical skills suggesting that at least certain features of language and music may rely on common learning mechanisms. Findings also suggest that a dimension that has so far been largely unexplored i.e., informal musical exposure and interactions in the home, may serve as scaffolding for extracting and internalising linguistic structures and information from the environment.

Keywords: musical skills, Home musical environment, language development, pre-schoolers

Live music in dementia care: Exploring key stakeholder role demands and training

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Music has both anecdotal and evidence-based promise as an adjunctive aid in dementia care. Live music is considered a particularly beneficial music modality, promoting strong salutary effects for people with dementia and their caregivers. Despite this promise, live music remains underutilised across UK care homes, and there is chronic underrepresentation regarding the perspectives of key supporting stakeholders; musicians and carers (care staff, activities coordinators, home management; henceforth 'stakeholders'). The aim of this PhD project is to explore key issues surrounding multistakeholder live music provision in dementia care; conceptual understanding associating theory and practice, key stakeholder role demands and training and multi-cultural care staff perspectives. In examining these issues, this doctoral study extends the work of a pilot project investigating the impact of music provision in UK dementia care in collaboration with the charity Lost Chord, who provide live music sessions in the UK. Our research team observed and video-recorded the delivery of nine live music sessions in dementia care homes in the South Yorkshire area and conducted semistructured interviews with musician volunteers and care home staff. This presentation will discuss qualitative thematic analysis of the interviews, addressing comparative stakeholder perspectives and experiences of live music and dementia care training, with respect to literature review findings. Initial recommendations for future music and dementia care training will be proposed. The results of this study demonstrate a desire for collaborative partnership across key stakeholder roles and flexible training programmes to promote informed knowledge and learning when providing live music as part of long-term dementia care. This vital work presents a basis for understanding the relational impacts of providing live music as part of residential dementia care. The results will be used to generate evidence-based guidelines tailored to advance multi-stakeholder training, development and delivery of music use in dementia care homes.

Keywords: musicians, care homes, dementia, caregivers, live music

Are we really hearing in our heads what we think we're hearing? The role of audiation in musical improvisation

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An important and valued part of the skill of musical improvisation is to be able to play what we hear in our head (audiation). Improvisation is a cognitively demanding activity, involving the production of musical material in real time. This requires the simultaneous involvement and coordination of many different skills, and places demands on working memory, memory retrieval, auditory and sensorymotor systems. Some recent studies support a cognitive model of improvisation which posits the deployment of stored rhythmic and melodic patterns via motor programmes. According to the theory of event coding, actions and their perceptual consequences share the same cognitive representation and behavioural and fMRI studies have offered evidence supporting this theory. Since musical actions have sounds as perceptual consequences and sensorimotor coupling is bidirectional, this is compatible with improvisers imagining the sounds as they play them. However, phenomenological accounts and interview studies suggest musicians use different strategies to generate ideas in improvisation, such as music-theoretic ideas and motor patterns or 'muscle memory'. So questions remain regarding the precise role of audiation in improvisation: what is musicians' experience of musical imagery as they improvise? Is auditory imagery cognitively prior to action or post hoc? How accurate is auditory imagery? What proportion of musical output involves audiation and how sensitive is this to context? The aim of this paper is to offer a coherent explanatory framework for improvisation from the perspective of cognitive psychology and to propose experimental paradigms to begin to answer some of these questions. On the basis of a review of the literature, it is concluded that two approaches offer a way forward: altered auditory feedback (AAF) and a blocking paradigm in which interference conditions seek to disrupt the tonal loop in working memory.

Keywords: audiation, improvisation, cognitive

Mild dissonance preferred over consonance in single chord perception

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Previous empirical research on harmony perception has mainly been concerned with horizontal aspects of harmony, turning considerable less attention to how listeners perceive emotions and acoustic qualities in single chords as such. A recent study (Lahdelma & Eerola, 2016) found mild dissonances to be more preferred than consonances in single chord perception, but the authors did not pursue any theoretical explanations of their finding. Moreover, they did not systematically vary register and consonance in their study. These omissions were explored here.

An online empirical experiment was conducted where participants (N = 410) evaluated pre-chose chords on the dimensions of Valence, Tension, Energy, Consonance, and Preference. 15 different chords (selected triads with inversions, tetrachords, pentachords and hexachords) were played with piano timbre across two octaves, with randomised roots (+- 5 semitones around C4 and C5). In addition, participants' musical sophistication and musical preference were measured.

The results suggest significant differences on all five dimensions across chord types. The register contributed to the evaluations, as well as triadic inversions. The mildly dissonant minor ninth, major ninth, and minor seventh chords were rated highest for preference across both expert and inexpert listeners. In addition, the participants' musical sophistication and musical preference moderately affected the chord evaluations. The role of theoretical explanations such as aggregate dyadic consonance (Huron, 1994), the inverted U-hypothesis (e.g., Berlyne, 1971), and psychoacoustic phenomena such as roughness, harmonicity, and sharpness will be discussed to account for the preference of mild dissonance over consonance in single chord perception.

Keywords: vertical harmony, psychoacoustics, preference, consonance/dissonance, chord

Adults' schematic and veridical expectations in response to melodic repetition.

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A key question pertaining to expectations that arise from melodic repetition is: if the violation of expectations communicates emotional pleasure, why does this continue to happen even when the listener knows what is going to come next? The answer may be that there exist two forms of expectation; schematic (deep-rooted memory learned from an individual's exposure to music, and hears music as though for the first time) and veridical (concerning specific memory for a piece or phrase within the music). The role of veridical expectations is downplayed in the literature, despite the intuition that music is often simultaneously surprising and unsurprising. The purpose of the present research is to utilise a continuous response methodology to provide empirical support for the theory that the two independent forms of expectation are engaged during listening to familiar music. In a withinsubjects experiment, 30 adults gave note-by-note expectancy ratings in response to a 4 times repeated 26 note monophonic piano melody. A week later, participants took part in an identical experiment, totalling 8 repetitions of the same melodic stimulus. 8 random distractor notes were heard between each melody repetition. Participants rated by moving their finger along a touch sensitive controller. Results support the hypothesis that the two forms of expectation are activated during music listening. With each melody repetition, participants demonstrate a systematic increase in expectedness, yet the pattern of expectation remains intact. This finding suggests that although schematic expectations have been shown to resist veridical expectations, there is a dynamic relationship that alters with each new hearing, which enables the listener to repeatedly enjoy a piece of music through the co-existence of two memory systems.

Keywords: melodic, rating, adults, continuous, expectation

Friday

Papers 5

M103

11:30

How conducting movement's kinematics communicates musical structures?

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Conductors use their body movement to communicate selected musical features. While listeners' and instrumentalists' musical movements have been widely explored and found to be closely related to musical structures including metre (Toiviainen et al., 2010) and phrase (MacRitchie et al., 2013), there is yet much to say about the particular ways in which conductors use their body movement to convey such musical structures. This study aims to contribute empirical observations on this topic, by examining how the kinematic features of conducting movement relate to musical structures such as rhythmic patterns, melodic peaks and dynamic changes. Six conductors rehearsed three pieces of music by Mozart, Dvorák and Bartók with a small string ensemble, while their upper body movement were recorded using the optical motion capture system, Qualisys. Kinematic parameters including movement distance, speed, acceleration, and jerk were extracted via Visual 3D and Matlab. Correlation analysis showed that conductors' movements have particular features respective to the music by different composers, and also musical passages with different rhythmic and melodic patterns. Temporal analysis of movement variability revealed conductors' movements at particular time points within each repertoire item which have distinctive movement kinematic features.

Keywords: conducting movement, kinematics, musical structure

Music-visual congruence and attention in film cognition

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This paper deals with structural congruence based on temporal alignment of accented events in the musical and visual stream of moving pictures, and its interactions with attentional processes.

First, definitions of music-visual congruence and its proposed underlying cross-modal matching or grouping principles will be discussed (Cohen 2014/13, Iwamiya 2013, Lipscomb 2013, Stein et al. 2010).

Second, models on film music will be discussed that consider the establishment of structural congruence and its attentional consequences as implicit, purely bottom-up processes. Cohen's (2013) Congruence Association Model predicts that the viewer-listener's attentional focus of the visual scenography is triggered by visual features which share structure with music. Her research on congruence explored its interpretational effects of associative meaning. Lipscomb (2013) examined perceptual effects of accent structure alignment; his model implements consequences on attentional focus shifts. Yet, the congruence-attention-mechanism remains to be empirically tested (Cohen 2013).

Third, this mechanism will be linked with the pip and pop phenomenon, a bottom-up driven effect which has successfully been demonstrated in behavioral and ERP experiments (Van der Burg 2008/2011). A simple auditory stimulus ("pip") can enhance the saliency of a co-occurring visual stimulus, making it more likely to be captured by attention and to pop out in a complex, dynamic context. Crucially, this effect depends on the saliency of the auditory events (Talsma 2010). Linking this research to the film music contexts, saliency enhancement due to rhythmical organisation of the musical stream will be examined.

Fourth, the unidirectionality of congruence and attention will be discussed. Talsma (2010) argues that top-down modulatory attentional strategies based on goals and expectations can boost sensory sensitivity to establish audiovisual congruence in the absence of critical saliency of the auditory stimulus. Implications will be considered for the models mentioned above and for empirical research on music-visual congruence based on task-relevant congruency judgements.

Keywords: rhythm, multimodal perception, film cognition, film music, attention

Social effects of interpersonal synchronisation during listening to music compared to a metronome: What can we learn from implicit measures?

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Interpersonal coordination, such as simultaneous rhythmic movement, is a fundamental way to form socioemotional connections. The social and emotional power of music might further strengthen such interpersonal bonds. Here, we tested if interpersonal synchronisation (synchronous vs. Asynchronous finger-tapping) affects sympathy and helpfulness more strongly when listening to music compared to a metronome. We tested 40 participants (20 females, M=23.7 years, SD=2.60) and used an explicit and an implicit measure to assess their social orientation toward a tapping partner (i.e. one of two experimenters). Participants directly rated the friendliness of the experimenter on a 9-point Likert scale. As a more indirect or implicit measure of social orientation, we counted the number of pencils (out of a total of eight) that the participants collected after the experimenter "accidentally" dropped them. After five seconds, the experimenter started to help the participants or collected the pencils herself. Results of the pencil test showed that participants were more helpful toward an experimenter who tapped synchronously compared to asynchronously, chi-square(1)=5.45, p=.020. Importantly, this result was completely driven by the effect of interpersonal synchrony during listening to music, chi-square(1)=12.26, p<.001. When listening to music, participants collected 38 pencils after tapping in interpersonal synchrony compared to only 13 pencils after tapping asynchronously. No such effect was found for the metronome. The results of explicit ratings of the experimenter's friendliness, however, did not confirm these effects. The direct ratings might have been more strongly influenced by social desirability or related motivational distortions. Since music is a product of social interactions and might even be the result of evolutionary adaptation, we conclude that especially during listening to music, interpersonal synchrony or asynchrony can fulfill or violate hard-wired social expectations. Additionally, we could show that implicit or indirect measures can help elucidate how music, movement and prosocial behavior are connected.

Keywords: sensorimotor synchronisation, joint action, interpersonal affiliation, social entrainment

Personality and musical preference using crowd-sourced excerpt-selection

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Music preference has been related to individual differences like social identity, cognitive style, and personality, but preference can be difficult to quantify. Self-report measures may be too presumptive of shared genre definitions between listeners, while listener-ratings of expert-selected music may fail to reflect typical listeners' genre-boundaries. The current study aims to address this by using a crowdtagging to select music for studying preference. For the current study, 2407 tracks were collected and subsampled from the Last.fm crowd-tagging service and the EchoNest platform based on attributes such as genre, tempo, and danceability. The set was further subsampled according to tempo estimates and metadata from EchoNest, resulting in 48 excerpts from 12 genres. Participants (n=210) heard and rated the excerpts, rated each genre using the Short Test of Music Preferences (STOMP), and completed the Ten-Item Personality Index (TIPI). Mean ratings correlated significantly with STOMP scores (r =.37-.83, p<.001), suggesting that crowd-sourced genre ratings can provide a fairly reliable link between perception and genre-labels. PCA of the ratings revealed four musical components: 'Danceable,' 'Jazzy.' 'Hard,' and 'Rebellious.' Component scores correlated modestly but significantly with TIPI scores (r =-.14-.20, p <.05). Openness related positively to Jazzy scores but negatively to Hard scores, linking Openness to liking of complexity. Conscientiousness related negatively to Jazzy scores, suggesting easy-going listeners more readily enjoy improvisational styles. Extraversion related negatively to Hard scores, suggesting extroverts may prefer more positive valences. Agreeableness related negatively to Rebellious scores, in line with agreeable peoples' tendency towards cooperation. These results support and expand previous findings linking personality and music preference, and provide support for a novel method of using crowd-tagging in the study of music preference.

Keywords: music preference; crowd-sourcing; personality

How do the functions of music listening vary across situations and persons?

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Research mainly examines the functions of music listening as traits, whereas the potential variability across situations receives scant attention. Although many researchers mention the importance of situational influences on the way we interact with music, research on situation sill is in its infancy. Hence, this study aimed to differentiate between dispositional and situational influences on the functions of music listening and to reveal their relative importance. Another goal was to identify the most important situational and dispositional variables predicting the functional use of music. To this end 587 persons completed an online study. Each participant sequentially described three selfselected listening situations and reported on situational characteristics (e.g. presence of other people, mood), the functional reasons for listening to music, and the music they usually listen to in the specific situation. After describing the listening situations, participants reported on sociodemographics and traits formerly shown to correlate with the functions of music (e.g. Big Five, musical taste). Mixed model analyses revealed that on average 36% of the variance of the functions was due to differences between persons and 64% of the variance was attributable to within-person differences between situations. Forf urther analyses all situational variables were within-subject-centered to separate situation-related from individual-related effects. Several situational predictors such as activity while listening or presence of other people were shown to have significant effects on all functions. In conclusion, the study gives valuable insight into how situational factors affect the functions of music listening. It further supports the conceptualisation of the functions of music as both state and trait. As this study is part of a project aiming to predict music selection behavior, the potential significance of the functions as predictors will be analysed in further steps.

Keywords: functions of music listening, situational influences, music in everyday life, use of music

Emotion regulation with music: Can our favourite tunes alleviate loneliness?

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Loneliness has been identified as a major risk factor for our health, but it can be influenced positively by the use of media. In order to feel connected to others, people often immerse emotionally in narratives or form para-social relationships with TV characters (Hawkley & Cacioppo, 2010). There are suggestions from empirical research (Derrick, Gabriel, & Hugenberg, 2009; Greenwood & Long, 2009; Saarikallio & Erkkilä, 2007), that music could serve a similar function.

To explore the effect of music listening on loneliness, a between-subject design with two factors was implemented: (i) The need to belong, which comprised three conditions of autobiographical recall (interpersonal distress, task-related distress, and control), and (ii) an imagined music listening situation, which included either preferred or casual music. Both factors were operationalised as writing tasks. Mood was assessed before, between and after the writing. After the tasks, measures of loneliness and attachment were collected.

The results of 141 participants indicate that preferred music does not buffer against the negative emotional effects of interpersonal distress. On the contrary, emotional loneliness was heightened through the imagination of a situation where one would listen to one's preferred music. Yet at the same time, those who were thinking of their preferred music were in a significantly better mood. So, even though preferred music boosted feelings of loneliness, it also raised the mood simultaneously.

To explain these unexpected findings, we surmise that thinking of one's favourite music shifts the attention to one's personal history as more participants reported feelings of nostalgia in the favourite than in the casual music condition. Such focus on personally meaningful moments of one's past might in turn emphasise the discrepancy between past and present relationships and therefore amplify the feeling of loneliness. Nostalgia might also contribute to the mood lifting effect of favourite music.

Keywords: music listening, social surrogacy, emotion regulation, interpersonal distress, loneliness

"I don't like that!" – Why and what for we dislike music

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Musical taste, understood as an attitude towards music, plays an important part in the way music listeners in Western cultures perceive and construct their self-concept. Listeners like or dislike specific music not only to satisfy their emotional and communicative needs, but also to create and affirm their own identity. But until now, research has focused mainly on the positive aspects of musical taste. To get to a better understanding of it, qualitative in-depth-interviews (N = 21) were conducted to explore the different dimensions and justifications individual participants offered in respect to music they particularly dislike. Prior to interview sessions the participants were asked to list their musical dislikes. Then, during the interviews, they were asked to give reasons for their rejection of each musical piece, artist or style given on their list and rate each item on a 10-point scale (0=neutral to 10=worst possible item). All interviews were analysed using qualitative content analysis. The results from this analysis show that reasons for likes and dislikes do not necessarily form opposite pairs, but are in some instances identical. Liking and disliking insofar serves the same function that listeners use both to express their identity and encourage social contact and cohesion. All participants confirmed that they can draw links between individual dislikes and their own identity. Disliking certain music also served as a means to avoid negative emotional states and moods, physical harm or unpleasant social situations. Additionally, musical expertise of listeners was identified as an important factor. So, the study provides further insight into the dimensions and functions of musical taste in general and disliked music in particular, and into how specifically individual dislikes are relevant for the creation and affirmation of one's self-concept.

Keywords: musical taste; dislikes; self concept

Electrolaryngography and electroglottography in the assessment of singing voice: A systematic literature review

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Electrolaryngography (Lx) and electroglottography (EGG) are non-invasive methods used to assess human vocal folds vibration, through the application of electrodes placed externally on either side of the neck at the level of the larynx, whose impedances can be monitored in vivo; they are widely used in clinics, laboratories, and professional voice studios to analyse speech and the singing voice. This paper provides a systematic review of the empirical investigation methods that make use of the LX/EGG in the analysis of singing voice, identifying and critically appraising the relevant studies, presenting a thematic analysis of the current applications, and highlighting research methodology and limitations of the tools.

Case-studies, pilot projects and major studies with detailed EGG/Lx based protocols, which provide an analysis of the characteristics of the singing voice, are included. The systematic review has produced a list of 83 evidence-based studies, sourced on electronic databases and the internet. The evaluation of the empirical studies published from the 80' highlights a broad range of applications in the science of the singing voice: analysis of the source-filter model in singers and its longitudinal development from childhood to adulthood; vibrato, tuning, vocal registers, various singing styles and blending in solo and ensemble performances; real-time visual feedback in singing training; effect of pregnancy, birth control pills and menstrual cycle on singing voice. Furthermore, the report shows several singing voice parameters measurable through LX/EGG that further expand the knowledge of this area, although the protocol sometimes lacks the completeness and transparency required to allow accurate reproduction. The report also recommends some best practices and limitations to be aware of, to avoid erroneous interpretations or faulty recordings (e.g., electrodes' size and placement).

Lx/EGG represents a powerful tool for the investigation of the singing voice in medical settings, research and teaching. Future research agendas are also proposed.

Keywords: electroglottography, electrolaryngography, singing, larynx

Mapping the sound world of the flute: Towards a classification of standard and extended techniques

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In the search for new sounds, flutists and composers started about fifty years ago to explore new ways of playing the flute. These new ways of playing – also named extended techniques – have since been well integrated in the sound world of the instrument. In the last decades, some literature has been published containing general explanations of these techniques, and composers have made them part of the contemporary music language. However, the techniques described in these writings are generally classified in a rather arbitrary way, according to a nomenclature that has been developed through exploration processes. In this contribution, a new classification of flute playing techniques is proposed, with the aim of grouping them according to their role in sound production and to the gestural parameters that are involved for each of them.

First, an overview of existing publications about extended techniques since the 1960s is given, listing the principal categories of flute extended techniques established by their authors. Then, three possible functions of playing techniques are described: sound production mode, modification of existing sound parameters, and modulation or periodical/aperiodical alterations of an existing sound. A list of articulators involved in the sound production gesture is also given, and playing techniques are presented according to these two elements of classification: function and type of gesture.

This will lead to give a better portrait of the sound possibilities of the flute, and will help music teachers, composers and musicologists to give more precise and accurate indications concerning standard and extended playing techniques. A more effective notation, taking in account these aspects of sound production and flute playing, will be made possible, making music analysis and transmission of musical gestures easier. Finally, this also could help instrumentalists – both performers and improvisers – to refine and diversify their sound palette.

Keywords: musical gesture, extended techniques, flute, contemporary music, classification

Verification and validation of the Musical Self-Concept Inquiry (MUSCI) to measure 'musical self-concept' of German students at secondary education schools

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Musical development can be very differently during adolescence and the mechanisms and reasons, which lead to these differences, are often objects of music educational research. To measure the aspects of musical development of German students, the psychometric construct 'musical self-concept' can be used. The first aim of this study was to verify the factor structure of the initial MUSCIquestionnaire to measure 'musical self-concept' of German students. The second aim was to respecify the underlying factor model as well as to validate the renewed sub-facets of the questionnaire with music-specific background variables (e. g. interest in 'music') as well as the construct 'musical sophistication'. Data of 516 students (f = 260, m = 251) from three Grammar (n = 382) and three Middle (n = 112) Schools as well as one Junior High School (n = 22) are presented. The data comprised self-assessed 'musical self-concept' and 'musical sophistication' as well as music -specific and demographic background variables. Data analyses included structural equation models, reliability measurement, and correlational analyses. Reliability and confirmatory factor analysis indicate only acceptable subscale reliabilities (alpha = .584 to .844) and model fit indices (RMSEA = .054, chi2/df = 2.519, TLI = .805 CFI = .829) for the initial MUSCI. In contrast, the re-specified factor model shows a good fit (RMSEA = .040, chi2/df = 1.808, TLI = .927 CFI = .941) as well as good subscale reliabilities (alpha = .635 to .799). In order to analyse concurrent validity, the relationships between the re-specified sub-facets of the MUSCI-questionnaire with 'musical sophistication' (r = .113 to .567) and musicspecific variables (r = .112 to .489) were defined. The results demonstrate that the renewed version of the MUSCI-questionnaire can be used to measure 'musical self-concept' of German students. However, a following multidimensional IRT must still confirm the model.

Keywords: questionnaire survey, musical development, secondary education, musical self-concept,

The effects of singing therapy on psychological and biological responses with women with postnatal depression (PND)

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This study aims to investigate the psychological and biological responses of new mothers with postnatal depression (PND) after singing. In a within-groups design, 40 mother-infant dyads will be randomly allocated to both group singing and group chatting interventions. Community musicians will lead singing therapies. Changes in psychological assessments of mood, anxiety and group bonding will be measured. Biological markers of the hypothalamic-pituitary adrenal axis (HPA) will be collected from saliva samples; hormones (cortisol, cortisone, progesterone, testosterone, dehydroepiandrosterone (DHEA)), and their ratios (cortisol/DHEA, cortisone/DHEA) will allow analysis for seven bio-markers. The relationships between the psychological and biological responses will be explored, and there will be an overall focus on how any changes may relate to the severity of current PND. This research will shed light on any changes pre and post singing, in order to highlight music's potential therapeutic effects for application in health and wellbeing settings. This project is currently in progress.

Keywords: health, singing, wellbeing, postnatal depression, bio-markers

Does musical training affect emotion processing abilities? Evidence for enhanced levels of empathy in amateur musicians

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It is generally believed that music can affect our emotions in the short-term. Despite this, there is a lack of understanding of how musical activity may affect our emotional well-being and processing abilities over the long-term. Here we explore whether musical activity increases emotional well-being and/or processing abilities. Two cross-sectional studies are presented. The first exploratory experiment tested 100 young, healthy adults of varying levels of musical training on a large battery of standardised emotion processing tasks using computerised, as well as paper-and-pencil, and visual and auditory testing methods. Behavioural tasks tested emotion recognition and questionnaires measured emotion regulation abilities, levels of empathy, depression, anxiety and self-positivity. The second experiment tested a further sample of 103 young, healthy adults. Surprisingly, no relationship between general emotional well-being and musical training was found, however we did find a relationship between musical training and levels of empathy, and the ability to recognise emotional sounds. We believe that the results support models that suggest we engage in mental state attribution and activate mirror neurons while attempting to understand emotion in music. We propose that this activation during musical practice might positively influence certain selective dimensions of emotion processing and interpersonal skills beyond the musical domain.

Keywords: musical training, empathy, emotional processing

Investigating cognitive mechanisms of social interaction through musical joint action

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Contagion, Empathy and Theory of Mind (ToM) are important social cognitive mechanisms that develop gradually in human ontogeny (Bischof, 2008), enabling humans to interact with other human beings in a complex manner. However, the development of cognitive mechanisms for early social interaction is still underexplored. Therefore, the aim of the current paper is to investigate these mechanisms in a broader range from a theoretical as well as empirical perspective. In particular, we propose a music-centered approach, which allows us to investigate cognitive mechanisms of social interaction independently of children's language skills in a musical joint action setting. In our theoretical part, we delineate the social cognitive mechanisms, namely contagion, empathy and ToM. Especially, we suggest emergence of joint attention around nine months in ontogeny as a mile stone of the social cognitive development. Further, we propose that joint attentional skills scaffold empathy and ToM and is necessary to enable complex social communicative behaviors such as joint action. Our empirical part focuses on joint attentional behaviors and explores these in musical joint action of children of different age-groups (1.5–2.5 y; 3–4 y; 5–6 y) by using structured observation of video-recordings (Bakeman&Quera, 2012). The observation session takes place in a regular lesson of music education for young children, which includes interactive clapping, dancing and other rhythmic and musical gestures under the guidance of a tutor. Results of analysing indicators of social interactions such as gaze following, mimicry, gestures, and intra- and inter-individual synchronisation will be presented. It is claimed that investigating musicaljoint action provides a new possibility to explore how increasingly complex social cognitive mechanism semerge in human ontogeny in social communicative behaviors across a wide range of age and adds to current methods in social cognitive neuroscience.

Keywords: Structured observation, Musical joint action, Development, Social cognition

The influence of rhythmic musical features on gait-related movement

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Music and its rhythm have a profound effect on our sensorimotor system. This becomes apparent when we spontaneously synchronise our movements to an external beat: when we nod our heads or tap our feet to a catchy tune, when we're out dancing, or, less obviously, when it influences the way we walk.

Music and other rhythmic auditory cues have been found to improve gait in patients with movement disorders in terms of, for example, stride length and gait symmetry (e.g. Thaut, 2005). In studies using both music and metronome beats, it has been found that music increases stride length compared to metronome beats (Wittwer, Webster, & Hill, 2012; Styns et al., 2007). However, insufficient research has been conducted concerning the musical features that could evoke this difference, and which gaitrelated movements might change under the influence of music. The current study aims to explore the relationship between gait-related movement and rhythmic musical features, as well as to investigate the differences in movement between walking to metronome beats and walking to music.

32 musical stimuli were chosen based on various musical features: tempo, pulse clarity, genre, and rhythm. Additionally, four metronome stimuli were used, corresponding to the tempi in the musical stimuli. Participants (N=20) were instructed to walk naturally to the stimuli, suggesting they could walkoff-beat if needed. An optical motion capture system was used to record participants' movements during the task.

Future kinematic analyses will explore correlations between specific body parts' movements (e.g. head, hands, or shoulders) and the above-mentioned musical features. Findings could have practical implications for sports science regarding the use of music while walking or running, and for musictherapy regarding the improvement of interventions for patients with movement disorders.

Keywords: musical features, motion capture, gait, music-induced movement

Finding new ways in studying music evoked emotions

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The study of music and emotion is a popular topic in the field of music psychology, but methods used to investigate this phenomenon are rather focused on how emotions in music are perceived rather than how they are experienced or felt. It is questionable if the standard methods like self-report (e.g. questionnaires, diaries) or measurements of heart rate, electrodermal activity and other physiological measurements give us enough information on how and if we experience emotions in music. Both methods are are highly based on interpretation and retrospective evaluation about a experience.

In my research I am looking for methods that give us more insight about the subjective experience of music evoked emotions in a more objective way.

By studying facial expressions of emotion, this might be achieved. If an emotional experience is rather strong, a facial expression of emotion is produced in the listener's face. It is well documented in the Facial Action Coding System developed by Ekman and Friesen (1978), which muscle groups need to be activated to form a specific facial expression of emotion. This gives us the possibility to determine if a music-evoked emotion is experienced (felt), without the subject having to focus too much (or at all) on their experience. Other than with continuous rating while listening to music (another popular method used), constant cognitive load can be avoided. In addition, we can supposedly be more certain that the subject does not refer to what he or she is perceiving in the music or what he or she thinks is supposed to feel, but that the expression in the face represents the emotion he /truly/ felt.

Since I am still at the beginning of my research, this presentation will rather focus on methods that can be used to study facial expressions of emotion rather than results.

Keywords: facial expression, perception, emotion

Effects of coaching on generalist primary music teachers´ classroom practice and their 'musical self-concept´.

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The majority of music lessons in primary schools are covered by generalist primary music teachers, usually with little or no training in teaching it. This practice-based research project is part a PhD programme to professionalise generalist music teachers in primary schools to teach music lessons. The aim of this study was to describe changes in the generalist primary music teachers´ didactic classroom practices in teaching music. Moreover, this study aimed to analyse the generalist primary music teachers´ development of their 'musical self-concept' (Spychiger, 2010). This longitudinal intervention study is qualitative in character. Participants were 8 generalist primary music teachers and 4 specialist primary music teachers (control group). The 8 generalist primary music teachers were divided into two groups. The first group (n=4) received four coaching sessions (group 1), the second group (n=4) received four coaching sessions and 56 hours of further education in music didactics (group 2). The control group received no special treatment. The individual coaching sessions for all generalist primary music teachers (group 1 and 2) followed the 'Content Focused Coaching' (CFC) concept. Empirical data were collected before the beginning and at the end of the study by video-observations of classroom performances in primary music lessons (n=24), and questionnaires concerning the teachers 'musical self-concepts' (n=24). The first findings seem to suggest on the one hand that generalist music teachers require fairly little support to enhance their didactic performance of teaching music in primary music lessons. But on the other hand it appears that coaching without a parallel measure of further education seems to be to no avail for the group of less musically trained generalist music teachers.

Keywords: primary school music lesson, video-based research, coaching, generalist, musical self-concept

Identity as a challenge in arts: Jennifer Walshe and her alter egos

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Identity needs limitation. It defines and restricts. From Adorno to Butler, identity works through negativity. To an artist, these boundaries may not seem attractive at all. He will thus search for other, less restrictive terms of identity. In her MA thesis, the researcher analyses works by composer-performer Jennifer Walshe with a focus on postmodernist views on identity. Aspects are social criticism when it comes to identities and the internet, role models presented by the media or authenticity in pop music. Moreover, Walshe seems to explore identity of music itself – the relationships of music and other art forms, of music and noise, ultimately of the human voice as expressing personality within a society. Often, Walshe separates pure sonic phenomenons from their original semantic content. Thus, the recipient has to create his own context in his imagination. Postmodernism has seen the death of the author – irritatingly, Walshe has a whole group of alter egos, Grúpat, do works for her. She thereby aims to push the boundaries of her sonic and artistic possibilities. Findings of the researcher's work will be presented at the symposion, including analyses of some of Walshe's pieces using the voice. Grúpat is featured regarding each alter ego's individuality in relation to Jennifer Walshe's identity as an artist, trying to answer the question whether Jennifer Walshe is an author who can take a stance.

Keywords: post-modernism, performance, identity

How trauma diagnostics could be improved?

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This research is at an early stage – test data have not yet been collected. The first objective is to make a review article about the study in the field.

In the next step we aim to investigate the use of new methods for the diagnosis of trauma. There are of course already many instruments to measure trauma symptoms, but some of these measurement results may be distorted for different reasons. It is possible, according to some researchers, to ignore these problems with the projective testing methods because some of these methods use ambivalent stimuli. This study is carried out by comparing the audible, visual and audiovisual, projective test methods with each other. We will use music together with visual material as audiovisual stimuli and study responses (e.g. emotional and traumatic content, reaction time) of traumatised persons (n=20) and control groups (n=20) to these methods' material. There are also plans to link the subjects' eye movements follow-up to testing.

The hypothesis is, that audiovisual, projective method is more efficient than auditory and visual projective method and produce more diagnostically useful material for assessment of trauma. If this is true, audiovisual projective methods should be developed to meet the needs of trauma research and clinical practice.

Keywords: trauma, test, diagnostics, audiovisual, projective

Audio analysis tools on the development of a musically expressive performance

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In this article we discuss how some techniques in sound and music computing could be used by musicians during their practice in novel ways, in particular for augmenting the self-assessment process that occurs while developing a musical performance. We will be focusing in aspects related to musical expression, in the context of western music. Advancements in music technology are increasingly present in musicians' daily routine, and fostered the development of music making and consumption. During the last fifty years, these technologies evolved in an astonishing pace, especially after the birth and popularisation of digital computing and the Internet. These advances are now present from the creation to the production and distribution of music. We believe that through an objective approach involving the computational analysis of physical aspects of the musical sound, musicians could gain access to novel dimensions for the perception of their performance, and greatly improve their understanding over it. Using advanced Music Information Retrieval techniques to model expressivityrelated aspects of instrument playing (e.g. note articulation and dynamics, timbre control, timbre blending, timing, vibrato, glissando), we aim at creating tools that would allow musicians to get new insight on their practice. In this project we present our proposal for applying state-of-the-art MIR tools in the analysis, development and practice of musical performance, trying to bridge the gab between computer music laboratories and the professional musician practice room.

Keywords: performance analysis, music information retrieval, music expression

The influence of imitative body movements on the sensitivity to the conductor's expressive timings

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Temporal coordination and expressivity are essential constituents of the conductor's expressive timings communicated to ensemble musicians. Success of this communication vastly depends on the ability of the conductor and musicians to perform and perceive gestures, and even more important, to integrate the perception of these expressive timings into actions.

The conductor's expressive timings have been studied both from a conductor's and an observer's perspectives, however body movements have not been considered yet from the perspective of a musician. Present research aims at investigating the role of imitative body movements of musicians in their sensitivity to expressive timings communicated by a conductor. Imitation is considered as a form of corporeal articulation, which is based on a mirroring process. By imitating other people, we see other people as similar to us, i.e. we can understand other people's actions, emotions and intentions. Therefore we believe that imitating the conductor's gestures will enhance musicians' understanding of the conductor's musical intentions, and accordingly increase sensitivity to temporal beat patterns. To test our hypothesis, we applied a repeated measures sensorimotor paradigm, based on a beat synchronisation task. A controlled design, quantitative measures, and ecologically valid auditory and visual stimuli were used. Participants were musicians experienced in playing under the lead of the conductor. Firstly, they had to watch and imitate the conductor's gestures by listening to the music and looking at the conductor. Secondly, they had to play a melody from the musical composition, which they had just listened, together with the conductor and an ensemble. A main dependent variable is synchronisation between a participant and the conductor. We suppose that after having imitated the conductor's gestures musicians would demonstrate better synchronisation performance.

Keywords: synchronisation, musical communication, imitation, conductor's expressive timings, body movement

Parai melam music in Jaffna Tamil culture, Sri Lanka: An ethnomusicological study

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Parai melam (a double-headed cylindrical drum played with two sticks) music occupies a significant position in Jaffna Tamil culture, Sri Lanka. This is an area which is worthy of scrutiny with regard to its emergence, development, uniqueness, position, performance, changes and continuity. In world drum tradition, parai melam music tradition has a long historical explanation, but unfortunately this performing art has become a diminishing culture due to various factors. These factors vary in the context of caste, culture and religious, rituals which are key spheres of Jaffna Tamil culture. As this music culture represents the notions of auspiciousness and inauspiciousness, this study further intends to explore anthropologically. Symbolic and cultural expressions of parai melam are most significant in caste and religious contexts. Though auspiciousness includes Hindu religious pantheon and rituals, performing arts and other fields of music, there is an ambiguity in the notion of auspiciousness while periya melam music is dominantly mandatory for auspiciousness in the Hindu pantheon of Jaffna. Seemingly, there are some drumming rhythms that are identified as inauspiciousness as they are associated with funeral observances. Structural replication and downward displacement and pollution and purity have characterised the nature of inauspiciousness of parai melam music and performers. The major objective of this study is to examine the position and placement of parai melam music in Tamil culture in the context of changing modern society, what are the structural and cultural consensus for making auspiciousness and inauspiciousness, and how the music rhythms are created, performed, taught, preserved, sustained, and continued? Methodologically, ethnographic research methods including ethnomusicological perspectives and methods have been employed in this study, which comprises qualitative data derived from the fieldwork conducted among the paraiyar community in different villages of Jaffna.

Keywords: Hinduism, auspiciousness, inauspiciousness, parai melam music, caste system

Friday

Posters 2

Hearing is believing: Towards a new method of analysis for vocal timbre in popular vocal song

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The way we use and manipulate sound in music is constantly evolving. Music analysis techniques, however, have not always kept pace with this evolution. This is particularly evident in vocal timbre analysis, specifically in popular, lyric based, vocal song genres (hence forth called popular vocal songs). This is problematic for popular vocal song analysis as this song type typically relies heavily on the vocal line for expression. Given the vocal line consists of both vocal timbre and lyrics, that we lack efficient and robust analytical techniques that can account the emotive content of vocal timbre, and its impact on emotional perception of lyrics, leaves a gap in our analysis.

This paper proposes the development of an analytical technique for vocal timbre analysis centered on the hypothesis that vocal timbre impacts emotional perception of sung words. The proposed technique considers how the emotive content of vocal timbre impacts emotional perception of lyrics. It can be summarised through the following model: if emotionally charged word/s are sung with an incongruent emotionally charged vocal timbre, then the emotional perception of that word/s is likely to be impacted by the emotion expressed by the vocal timbre. Two reception tests were conducted to test this hypothesis – results from these tests support the hypothesis.

This model forms part of the proposed technique which will be a multi-step process addressing the following areas: 1) the appropriateness of vocal timbre analysis, 2) how to make vocal timbre analysis clear and efficient, 3) how to approach analysis of a musical element that is predominantly aural in nature (i.e. not usually not conventionally written down). The first two steps situate and streamline our analysis, while this final step forms the basis of analysis. This paper will introduce this analytical technique and provide a case study to demonstrate its application.

Keywords: vocal timbre, emotional perception, vocal timbre analysis, popular vocal song, popular music theory

How important is the reproduction technique for the perception of spaciousness in music?

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Background:

Sound fields are preferred when spaciousness is perceived (Blauert and Lindemann, 1986). "Spaciousness means that auditory events, in a characteristic way, are themselves perceived as being spread out in an extended region of space" (Blauert, 1997). The author's former study (2012) investigated the perception of spaciousness of five musical genres. Participants evaluated spaciousness while listening to music with loudspeakers. Resulting, these genres allowed classifications of spatial features such as "big", "wide" and "open". A new idea of conducting listening tests has arisen using wave field synthesis instead of headphones (e.g. Laumann, Theile and Fastl (2008)).

Aims:

Firstly, this study aims to reveal the perceptional characteristics of spaciousness in music itself with headphones, loudspeakers and wave field synthesis. Secondly, it will find the differences of perception when participants listen with headphones, loudspeakers and wave field synthesis. Thirdly, this study's goal is to investigate the possibility of replacing headphones with wave field synthesis for listening tests.

Method:

A hearing test has been conducted asking participants for their spacious impression. Participants rated 30 music excerpts on a 7 Point-Likert-Scale from "little spacious" to "much spacious". The music excerpts were recorded in an anechoic chamber with various instruments and played to 28 Participants through headphones, loudspeakers and a wave field synthesis system including a tracking system. Dummy head measurements for an objective comparison were made.

Results:

3x3 ANOVA repeated measures revealed a significant Within-Subject effect for the technical devices ($F = 4.541$, $p < 0.05$), different instrument groups ($F = 71.281$, $p < 0.01$) and also for the interaction technical devices-instrument groups ($F = 7.700$, $p < 0.01$).

Conclusion:

The kind and number of music instruments on the one hand and the reproduction technique on the other hand influences the perception of spaciousness. Consequently, the reproduction technique is somewhat important.

Keywords: music perception, psychoacoustics, spaciousness, wave field synthesis, acoustics

"Music in mental hospital" – Historical perspectives on the use of music and music therapy in Finnish psychiatric hospitals

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Music has been part of Finnish hospital psychiatry for more than 100 years. Now this tradition is fading. Psychiatric services have undergone profound changes over the last few decades. Hospitals have been downsized or closed, and the treatment of patients has been handed from institutions to the community and general hospitals.

Psychiatric music therapy has evolved from hospital treatment (Aldridge 1996). There is a historical need for music therapy, and today's music therapy needs a history (Horden 2001). According to previous studies, music therapy in Finland began as recreational activity in psychiatric and other institutions. Since the 70's music therapy has developed into its modern forms.

This research paper is part of a Ph.D. study on music therapy at the University of Jyväskylä, Finland. The study traces the evolution of general music use and music therapy in Finnish psychiatric hospitals from late 19th century to the present.

The data were collected from historical documents, books and articles on music therapy, and examined using qualitative content analysis. For verification, face validity was used.

The results suggest that music has been utilised in hospitals in multiple ways; connecting to hospital culture, treatment and rehabilitation, and religion. From its early design, the purpose of music therapy has become more specific.

Descriptive analysis yielded more information on the use of music and music therapy in hospitals. The concrete purposes were harder to identify, and hermeneutics was used to interpret the results. Further research is required on the evolution of psychiatric services. The related Ph.D. study aims to stimulate discussion of future opportunities and development of adult music therapy. This poster presentation is aimed at therapists, and those interested in cultural history, psychiatry, and the healing power of music.

Keywords: psychiatric hospitals, qualitative content analysis, music therapy, cultural history

The Quartet Theory of Human Emotions and the Human Sadness System compared: Music-evoked sadness and joy

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During the last two decades, there has been an enormously increasing interest in the neural correlates of music-evoked emotions and the evolution of music.Recently Stefan Koelsch and colleagues (Koelsch et al. 2015) proposed an integrating framework for the neuroscience of emotions with their Quartet Theory of Human Emotions (QToHE). With the Human Sadness System (HSS) Jaak Panksepp (2003, 2009) offered a biopsychological account for understanding the strong emotion evoked by sad music. My aim is to explore QToHE's potential for research on musical emotions in connection with HSS. A comparative analysis of QToHE and HSS focusing on cingulate cortex, periaqueductal gray area, thalamus, and hippocampus from the perspective of functional neuroanatomy is given. Aspects of evolutionary considerations are also taken into account. My main results are that both QToHE and HSS incorporate cingulate cortex, periaqueductal gray and thalamus. But QToHE puts the hippocampus back again into focus for emotional processing of music-evoked joy and tenderness whereas the hippocampus is lacking in HSS. HSS is heavily based on evolutionary considerations and cross-species research tracing HSS back to the Guinea pig's separation distress circuit whereas QToHE is based on results of investigating human brains by imaging studies and evolutionary considerations are not its main focus. The brain-stem related affect-system of QToHE incorporates besides the reticular formation for arousal also as another part as in HSS the periaqueductal gray area which mediates vocal expression of emotions. My conclusion is that connecting both theories might help to solve the riddle why music-evoked sadness is experienced in a pleasurable manner (Sachs, Damasio, & Habibi 2015). Therefore, future research on music-evoked emotional processing of sadness should be carried out by investigating how the processing of music-evoked emotion in HSS relates to processing the positive emotions of joy, tenderness, and peacefulness mediated by the hippocampal formation.

Keywords: hippocampus, Quartet Theory of Human Emotions, Human Sadness System, music evoked emotion, sadness

Isomorphism of pitch and time

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An ongoing debate regarding the perception of pitch and time is whether information on the two dimensions is processed independently or interactively. To study this, we tested whether listeners prefer sequences in which tonally stable tones coincide with rhythmically stable tones. Our study builds on a noted isomorphism between pitch intervals in the diatonic scale and tone durations in the standard rhythm originating in Ghana. This isomorphism is shown in a) the maximally even structure of 2212221 and b) the cyclic nature with seven possible starting points. To better understand pitch-time relationship, we conducted two experiments. In Experiment 1, we created seven scales based on the diatonic pattern and seven rhythms based on the standard pattern by shifting the starting pitch interval or tone duration. To measure the perceived tonal stability of tones in the scales, in Experiment 1a each scale was followed by a probe tone and listeners judged how well the tone fit into the scale. To measure the perceived rhythmic stability of tones in the rhythms, in Experiment 1b each position of the sequences was accented dynamically and listeners judged how well the accent fit into the rhythm. These ratings were then used in analyzing the results of Experiment 2 that used all 49 pairs combining the 7 scales and 7 rhythms in Experiment 1. Participants rated a) how well the rhythm fits the scale for each pair and b) familiarity and well-formedness of each scale and rhythm. Results show that probe ratings from Experiment 1 predict judgments in Experiment 2. Specifically, scale/rhythm pairs received higher ratings when tonal and rhythmic hierarchies correlated more strongly with each other. In addition, we found a familiarity bias toward the major scale. After accounting for this bias, results remain significant, suggesting that information from the two individual dimensions interact perceptually.

Keywords: pitch-time relationship, tone duration, probe tone, diatonic scale, standard pattern

Proceedings

Are We Dancing to the Same Beat? Empathy and Interpersonal Synchronisation in the Silent Disco

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Abstract

Previous 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 the Big Five. One of each pair hears the original track, while their partner hears it either: unchanged (the synchronised condition), time-shifted by a quarter beat, or with a slightly stretched tempo. Subjective measures of enjoyment and affiliation were used to compare conditions, revealing that pairs subjectively rated their interaction as better when in the synchronised condition, although there was no effect on subjective enjoyment. Three styles of coping with asynchrony were observed, and these may be explained by personality differences. Furthermore, an association was observed between the Agreeableness trait and giving a positive rating to partner interaction in the Synchronised condition, indicating that high Agreeableness may predispose one to be more attuned to interpersonal synchrony. This study may provide new insights into the role of synchronisation in social dancing as it suggests that shared experiences create a greater sense of affiliation when shared in time.

Keywords: silent disco, music and movement, empathy, dance, entrainment

Introduction

An ever increasing body of literature has explored the relationship between music and movement. People move spontaneously to music, and have a capacity for rhythmic entrainment (Chen, Zatorre, & Penhune, 2006). There are also individual differences in the way people move to music (Luck, Saarikallio, Burger, Thompson, & Toiviainen, 2010), and respond emotionally to music (Thompson, McIlwain, Eerola, & Vuokoski, 2012), depending on personality. Music, movement and emotion appear to have much in common.

Dance may be considered the expression of music through movement. A broad definition is used for the purpose of this paper, in which any auditory stimulus with a regular pulse or beat may be considered music. Any movement which is rhythmic in nature, and which is produced with the intention of synchrony with music, may then be considered dance. This definition is contingent upon intention, not actuality, as an individual may intend to dance in time with a beat, but fail to do so for any number of reasons.

Music and Empathy

Empathy is an important process by which we can perceive emotion, both in other people, and in music. It can be defined as the capacity for one to take the perspective of another, and individual differences may be measured in the Trait Empathy construct (Baron-Cohen & Wheelwright, 2004). Individual differences in Trait Empathy have been studied extensively.

Previous research has found relationships between the Big Five and Trait Empathy, in particular with the Agreeableness factor of the Big Five (Bamford & Davidson, 2015; Del Barrio, Aluja, & García, 2004). Furthermore, both Agreeableness and Trait Empathy have been related to aspects of rhythmic ability and dance (Bamford & Davidson, 2015; Strauß & Zentner, 2015). Empathy also has important social roles, in understanding and communicating with others.

Group Bonding through Music

It has also been suggested that synchronous activity focuses participants on others in the group, while transcending differences between individuals (McFerran, 2013); one sees others as bodies in motion, and focus on the motor processes of entraining with that motion, rather than focusing on other traits that may mark the other as different to the self. Furthermore, some have proposed that moving in synchrony serves to blur the psychological divide between the self and the other (Tarr, Launay, & Dunbar, 2014). In essence, this implies that dance enhances empathy between participants.

It is possible that the promotion of empathy through dance is key to its social bonding effect. Behrends, Müller and Dziobek (2012) and Berrol (2006) suggest that dance may be used in therapeutic contexts to enhance empathy. These studies are based upon the idea that synchronous movement may be an empathic process.

While there has been much research on imitation and social bonding, Hove and Risen (2009) were amongst the first to study synchronous movement and social bonding in an experimental setting. They found that, in a finger tapping scenario, a participant would develop a greater sense of affiliation towards the experimenter when both were tapping in synchrony (Hove & Risen, 2009). This effect has been replicated in both infants (Cirelli, Einarson, & Trainor, 2014), and 4-year-old children (Kirschner & Tomasello, 2010). Not only does this demonstrate a relationship between cooperation and synchronous movement, but it also suggests that this behavioural mechanism exists from a very young age.

Some have theorised that neurohormones released during exercise have a social bonding effect, which could explain the effect of dancing on social bonding (Tarr et al., 2014); these neurohormones also increase pain tolerance, meaning that pain threshold can be used as a proxy measurement. Tarr, Launay, Cohen and Dunbar (2015) measured pain threshold as well as self-reported social bonding in High School aged children, finding independent effects of exercise and synchrony on social bonding. Social bonding through dance may be partially influenced by simple physical exhaustion, however interpersonal synchronisation appears also to play a role. Adequately controlling for synchronisation in an experimental setting provides quite a challenge, for which new methodological approaches are required.

The Silent Disco

The concept of a silent disco is a twist on a traditional party in which, rather than having a speaker system, only the participants with headphones can hear the music ("Silent disco," 2015). Some silent disco events even have multiple DJs running multiple channels such that not every participant is even listening to the same music (for example, http://youtu.be/6RKCaHn5LHg). The result is that the shared group experience of dancing together is separated from the experience of rhythmic entrainment with other dancers.

This situation provides an opportunity to study the role of rhythmic entrainment in the experience of social dancing. Indeed, Woolhouse and Tidhar (2010) began investigating this by getting two groups of participants to dance in a room together, while each group was listening to different music in a 2 channel silent disco scenario. Afterwards, each participant was asked to recall certain features of the other participants, finding that memory for those in the same group was better than for those of the other group (Woolhouse et al., 2010).

The silent disco may also be used to examine the role of synchrony in social bonding. A study by Tarr, Launay and Dunbar (2016) found an effect of synchrony on both a questionnaire measure of social closeness and on pain threshold. In this experiment, groups were instructed to perform particular movements, controlling for creativity. Both of these studies provide good examples of the Silent Disco research paradigm.

The Present Study

The present study aims to investigate how important interpersonal synchronisation is to the experience of social dancing. This will be done using a Silent Disco scenario. Unlike the experiment by Tarr and others (2016), the present study allows participants to dance freely rather than to choreographed movements, to maintain a more naturalistic setting. The timing of musical stimuli between participants will be manipulated in three

conditions: Synchronised, Tempo-Shifted and Phase-Shifted. It is expected that participant pairs who listen to congruent musical stimuli, in the Synchronised condition, will feel a greater sense of affiliation towards each other than those listening to incongruent stimuli.

Methods

Participants

Participants were recruited through online advertisements on Facebook and mailing lists. Most participants were current international students at the University of Jyväskylä, between the ages of 19 and 31 (Mean=25.17), and all had completed at least a High School level of education. There were a total of 48 participants (76% Female), making for 24 pairs. Participants self-selected their partner for the silent disco activity, ensuring that all participants were dancing with someone they were comfortable with. This resulted in 20 Female-Female pairs, 3 Male-Female, and 1 Male-Male. All participants were asked to complete the battery of personality measures, as well as questions about music and dance experience. 62% of participants had received some kind of formal dance training, and reported enjoying dancing (Mean=8.3, on a scale of 10). No participants were excluded.

Materials

All participants completed a questionnaire battery as part of recruitment. This battery will include the Empathy Quotient 8-item version (EQ-8), Toronto Empathy Questionnaire (TEQ) and the Big Five Inventory (BFI) in addition to demographic questions about education, musical and dance experience. The EQ-8 is a shortened form of the Empathy Quotient (Baron-Cohen & Wheelwright, 2004), developed by Loewen, Lyle and Nachshen (2009). The BFI is a 44-item measure of the Big Five, included to gain some general insight into participants' personalities (John & Srivastava, 1999).

The musical stimuli were created from 30 second excerpts of six songs. Of these, there were three Motown songs and three electronic dance tracks, of a range of tempi from 90 to 140bpm. Each piece had high pulse clarity and percussiveness, with a strong bass, as these features produce the most regularity in music induced movement (Burger, Thompson,

Luck, Saarikallio, & Toiviainen, 2012). Each of the six excerpts was manipulated in one of two ways: either the tempo was stretched by 5% towards 120bpm, or a delay of a quarter-of-a-beat was added to the start of the track. 120bpm was chosen as an ideal average tempo, based on previous research. Stimuli were played using a Max/MSP patch which randomised their presentation order and controlled timing of playback. Participants wore a pair of wireless headphones to isolate the musical stimuli between them.

A self-report questionnaire was also included, to assess how participants felt during the task. This consisted of five questions about their experience while dancing, and was administered at the end of each condition. The questions were: "How much did you enjoy this task?" "How comfortable did you feel during the task?" "How would you rate the interaction between yourself and your partner?" "Did you feel anxious or nervous during the task?" and "How much did you enjoy the music?" Their response was recorded on a 10-point scale.

Procedure

Individual participants were recruited online, and asked to bring a partner with whom they were comfortable dancing. Each pair came into the motion capture lab and were assigned the experimental conditions in random order. Each of the three conditions consisted of 12 musical stimuli, playing the six 30s tracks twice. This allowed for counter-balancing the tempo shifted stimuli. In the 'Synchronised' condition, both participants had the same stimuli, hearing both original and tempo shifted versions at the same time. The 'Tempo' condition presented the original track to one participant, while the other heard the tempo shifted version of that same track; the reverse would also occur, so neither was only getting tempo shifted tracks. Finally, the 'Phase' condition only included songs in their original tempo, but for one participant the stimulus would begin 90° behind the other; again, this was counter-balanced so that both participants would experience being out of phase for each stimulus.

At the start of the study, both participants were informed that the study was about social interaction on the dance floor, and instructed to move freely to the music that they heard. They were told that they would both be

hearing the same music, and that the headphones were simply being used as a side project, to test whether they worked for stimulus presentation in a motion capture setting, for the sake of future research. At the end of the 12 stimuli of each condition, the participants were asked firstly to stand comfortably while the system recalibrated, and then to step towards a computer one at a time to complete a short questionnaire about their experience during the task. Once both participants completed the questionnaire, they would then be asked to step back onto the floor for the next condition. Once the pair completed all three conditions they were debriefed; first being asked what they thought the study was about, as participants were provided very little background to the study, and then being informed of its true aims.

After the lab experiment, all participants were given the personality questionnaire battery, including the EQ-8, TEQ, BFI, OMSI, and demographic questions. This was completed online.

Results

The results presented here specifically concern the questionnaire data collected, and do not include analysis of the Motion Capture data. Analysis was done in the PAST statistics package (Hammer, Harper, & Ryan, 2001).

Effect of Synchrony on Self-Reported Experience

As the questionnaire yielded ordinal data, non-parametric statistics were used. A repeated-measures Friedman's test found a significant effect of synchrony condition on the question "how would you rate your interaction with your partner?", $X^2(2) = 7.1979$, $p < .05$. Post-hoc analysis using Bonferroni corrected Wilcoxon signed-rank tests revealed a significant difference between the Synchronised and Phase conditions, $W = 433$, $z = 2.818$, $p < .05$, with a moderate effect size, $r = .288$, but no difference between the other conditions. Descriptive statistics for the responses to this question may be found in Table 1.

Table 1. Descriptive statistics for answers to the question "How would you rate your interaction with your partner?" across the three synchrony conditions.

	Synchronised	Tempo-shifted	Phase-shifted
N	48	48	48
Median	9	7.5	8
SD	2.07	1.93	2.37

No significant effects of condition were found on any other questions.

Personality

Correlations were conducted between the self-reported rating of partner interaction during the task and personality measures from the TEQ, EQ-8 and BFI. Only the question about partner interaction was chosen, given the observed effect on responses to this question of synchrony, to determine whether there was a possible interaction with personality.

A significant correlation was found between the two measures of Trait Empathy: the TEQ and EQ-8, $r = .504$, $p < .01$. The Agreeableness scale of the BFI correlated with both the TEQ, $r = .484$, $p < .01$, and EQ-8, $r = .390$, $p < .05$. The TEQ was found to correlate with Openness as well, $r = .440$, $p < .05$, while the EQ-8 correlated with Extraversion, $r = .438$, $p < .05$.

Further correlations emerged when considering personality and ratings of partner interaction. Agreeableness had a positive correlation with the partner interaction rating, $r = .401$, $p < .05$, meaning participants who scored higher on Agreeableness tended to rate the interaction as better. This was more pronounced in the Synchronised condition, $r = .451$, $p < .01$, than in the Tempo-Shift and Phase-Shift conditions, indicating a possible interaction effect between the experience of dancing in synchrony and Agreeableness.

Discussion

The results presented here provide some support to the primary hypothesis, that

interpersonal synchrony is important to social affiliation on the dance floor. Participants did report a better interaction with their partner when they were both listening to the same music, in the same time. Furthermore this effect seemed more pronounced for those who scored higher on Agreeableness.

The Importance of Synchrony

Each pair danced together in a silent disco scenario, so that the music could be presented in different timings between participants. They completed three different conditions (presented in a random order): synchronised, tempo-shifted, and phase-shifted. The condition allocated to the pair had a significant effect on how they rated the interaction with their partner. The effect of being out of phase seemed to be the most pronounced, which significantly, negatively impacted upon their experience of dancing with their partner. It is worth noting that with the Tempo condition, subjects would, at least sometimes, find the beat falls in synchrony, while the Phase condition would always be out of phase. Therefore, it may be that Tempo-shift could be considered a less consistent, and thus more disruptive, form of Phase-shift. Having a dance partner always slightly behind, or ahead of the beat may be worse than a partner who drifts in and out of phase.

Unexpectedly, there was no effect of synchrony on any of the other self-report measures of the task experience. One may have predicted that enjoyment of the music may be influenced by social interaction while listening to it, but ratings of musical enjoyment remained unaffected by the movements of the partner. This is, however, consistent with the findings of Tarr and others (2016), who similarly found that synchrony only influenced social bonding, but not personal enjoyment of the music.

Personality

There were some expected correlations within the personality traits measured. Previous studies have found a relationship between Trait Empathy and the Agreeableness factor of the Big Five (Bamford & Davidson, 2015; Del Barrio et al., 2004). This was replicated here, finding a strong positive relationship between Agreeableness, EQ-8 and TEQ. It is particularly encouraging that the EQ-8 and TEQ share a relationship, as they purport to measure the same construct of Trait Empathy, and consist of rather similar items.

Positive, but relatively weaker, relationships were also observed between the EQ-8 and Extraversion, and between the TEQ and Openness. This may indicate that these other factors of the Big Five reflect other aspects of Empathy. Some previous research also suggests that the Big Five themselves are not entirely unrelated factors (Anusic, Schimmack, Pinkus, & Lockwood, 2009; Digman, 1997). Indeed, the present study did observe relationships between Agreeableness and Neuroticism, as well as Conscientiousness and Extraversion. Care must be taken, however, in interpreting relationships within the Big Five in a relatively small sample.

Personality and Synchrony

Given that personality data had been collected, it was possible to investigate how self-reported ratings of the task experience were influenced by personality. The most interesting relationship was between Agreeableness and self-reported partner interaction. When broken down into the three conditions, the strongest positive relationship between Agreeableness and the rating of partner interaction was found in the Synchronous condition. This suggests, perhaps, that those who score higher on Agreeableness are particularly perceptive of others moving in synchrony with them.

Previous studies have found an effect of interpersonal synchrony on social bonding or pro-social behaviour, but have been more strictly controlled, involving finger tapping or simple movements (Cirelli et al., 2014; Hove & Risen, 2009). The work by Tarr and others (2016) also found an effect of synchrony on social bonding in a dance setting, however both their measurement of social bonding and manipulation of interpersonal synchrony were quite different in nature to the present study. Their 'partial synchrony' condition presented the music in the same time, but instructed participants with different choreography, while the 'no synchrony' condition presented participants with entirely different musical stimuli. By prescribing choreography to participants, Tarr and others (2016) may not have in fact been measuring the effect of synchrony, but that of imitation.

While interpersonal synchrony has been less studied, there is comparatively more research on imitation and social bonding. It is generally found that behavioural imitation creates social affiliation (Lakin & Chartrand, 2003). Casual observations of people, when moving freely on a dance floor, reveal imitation in abundance. Dancing is a creative enterprise, and dancers gain the approval of their co-dancers through imitation of movements.

Creativity may be important. A study on group singing by Sanfilippo (2015), found that both acting in synchrony with others, while also maintaining creative expression through limited degrees of improvisation, yielded a far greater social bonding effect that all singing in unison. The same may be true for dancing; social bonding may occur best when dancers can create and imitate, in synchrony.

The potential implications of this area of research are great, although somewhat beyond the scope of this study. Understanding how dance enables social bonding has implications for our understanding of the function of music-dance throughout our evolutionary history. There are also possibilities to gain greater understanding of the neurological structures behind social cognition. Finally, there may be applications in social policy and in therapy, if it is possible to increase social connectedness, pro-social behaviour, or even empathy, through dance.

Conclusions

The present study explored the importance of interpersonal synchrony in building feelings of affiliation in a social dance setting. It suggests that synchrony is an important factor in the experience of interacting with a partner on the dance floor, by using the silent disco scenario to control the timing of musical stimuli between partners, and thus controlling their degree of synchrony. While in the synchronous condition, participants self-reported having a better experience interacting with their partner than in the two asynchronous conditions. Furthermore, personality measurements indicate that people who were high on Agreeableness were more sensitive to synchronous movement, rating their experience of this condition as better than their less Agreeable peers. Further research will examine the styles adopted by participants

when their partner is dancing to a different beat: to lead, to follow, or to ignore. This may also be related to personality differences. Behavioural measures of social affiliation will also be used to reinforce the self-report measure.

As much of the background literature is theoretical, with few studies specifically testing interpersonal synchronisation and affiliation, the present study adds empirical weight to the theory that music and dance serve a purpose in building social cohesion. This has implications for dance and music therapy, as it emphasises the importance of interpersonal synchrony in the therapeutic process, for building affiliation between therapist and client, or between clients in a group setting. Furthermore, it supports an argument for rhythmic art forms (music and dance) as community building projects to enhance social cohesiveness. Three factors that may contribute to the social bonding effect of dance are identified: shared creativity, imitation of gesture, and synchrony of movement. More research is required to fully understand the role of these three factors, however the present study supports the assertion that interpersonal synchrony leads to a greater sense of affiliation than simply sharing the experience of dancing (but not in time). This has implications for some of our theoretical constructs surrounding the mechanisms and functions of music in a social setting. It may be that moving in time through music in dance is a uniquely powerful way of bringing people together.

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Mapping the sound world of the flute: towards a new classification of standard and extended techniques

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Abstract

In the last decades, some literature has been published about extended techniques, and composers have made them part of the contemporary music language. However, the classification of extended techniques in these writings is often arbitrary, based on the way they have been discovered and used. In this contribution, a new way of classifying flute playing techniques is proposed, with the aim of grouping them according to their role in sound production and to the gestural parameters that are involved for each of them. First, a definition of the concept of extended technique is given. An overview of publications since the 1960s will show the existing classifications; then types of musical gesture according to Cadoz and Wanderley (2000) and a classification of extended techniques based on the musical instrument classification system by Hornbostel and Sachs (1914) will be applied to the flute, with a description of the articulators involved in the flute sound production.

Keywords: contemporary music, flute, extended techniques, classification, gesture

Introduction

In the search for new sounds, flutists and composers started about fifty years ago to explore new ways of playing the flute. These new ways of playing – also named *extended techniques* – have since been well integrated in the sound world of the instrument. In the last decades, some literature has been published containing general explanations of these techniques, and composers have made them part of the contemporary music language.

However, the techniques described in these writings are generally classified in a rather arbitrary way, according to a nomenclature that has been developed through exploration processes and repeated use in musical composition. In this context, it can be difficult to access a complete and detailed portrait of the actual existing techniques. In this paper, we will propose a new way of classifying flute playing techniques based on types of musical gestures as described by Cadoz and Wanderley (2000) and on the musical instrument classification system by Hornbostel and Sachs (1914).

First, an overview of existing publications about extended techniques since the 1960s will be given, listing the principal categories of flute extended techniques established by their authors. Then, three categories of extended techniques will be given, according to the type of musical gesture: excitation, selection and modification. For excitation gestures, an application of the musical instrument classification system by Hornbostel and Sachs (1914) is proposed. Finally, for a better understanding of the selection and modification gestures, the articulators involved in the sound production gesture will be listed with a description of their role.

Methods

The standard way of playing the flute consists of using the instrument as an edge-blown aerophone (by blowing against the edge of the embouchure hole in order to produce an oscillation of the air flow). The flutist also usually chooses fingerings that correspond to pitches on the tempered scale and tries to keep the best possible homogeneity in tone, in all registers and dynamics.

An extended technique could be defined as a way of playing a musical instrument that goes beyond or that is not part of the standard instrumental technique. For instance, in the case of flute playing, an extended technique can be an alternative way of producing a sound vibration with the instrument, the use of uncommon articulations and/or alternative fingerings, a technique that breaks the tone homogeneity of the instrument, or a way of playing that results in pitches that are not part of the equal temperament.

Overview of existing literature

The publication of articles and books about extended techniques began nearly fifty years ago, with John C. Heiss and his article "*For the Flute: A List of Double-Stops, Triple-Stops, Quadruple-Stops, and Shakes*" (Heiss, 1966). As the title says, this article investigates *multiple sound* techniques (which will be called multiphonics later). This exploration is also the main subject of Bruno Bartolozzi's book *New Sounds for Woodwinds* (Bartolozzi, 1967) and Heiss's second article, "*Some Multiple-Sonorities for Flute, Oboe, Clarinet, and Bassoon*" (Heiss, 1968).

In the 1970s, authors begin to be more exhaustive in their writings and to explore other kinds of playing techniques. John C. Heiss, in a third article named "*The Flute: New Sounds*" (Heiss, 1972), explores various ways of producing new sounds on the instrument: key slaps, trumpet sounds, low harmonics, whistle tones, noise elements in the sounds, and so on. Authors Lawrence Singer, Harvey Sollberger, Sheridan Stokes and Richard Condon are also known for having written about extended techniques for flute and woodwinds (Toff, 1986, p. 213-223).

Thomas Howell's book *The Avant-Garde Flute* "is intended as a source of information which would help flutists and composers make what seems [to the author] a necessary connection between composition and performance" (Howell, 1974, p. V) and give the reader very detailed information about flute acoustics and various sound effects on the instrument. Howell seems to emphasize timbre changes in flute sound and describes techniques such as alternate fingerings, pitch bend, whistle tones, colored noise, blowing like brass and singing with the flute. In Germany, Martin Gümbel publishes in the same year *Neue Spieltechniken in der Querflöten-Musik nach 1950* (Gümbel, 1974), in which he presents extended techniques more as musical gestures than as sound effects.

One year after, Robert Dick writes the first edition of his well-known book *The Other Flute,* which has become a reference for most contemporary flutists and composers. According to the second edition (published in 1987), there are three kinds of extended techniques: single sounds and tone coloration, multiphonics, and other resources, such as fluttertongu-

ing, jet whistles and percussive sounds (Dick, 1987).

In the 1990s, flutist and conductor Pierre-André Valade adopts a new approach by describing extended techniques used in solo flute works by 15 composers; there are two main categories: percussive modes (*modes percussifs*) and sound processing (*traitement du son*) (Valade, 1990). Pierre-Yves Artaud and Gérard Geay's treatise *Flûtes au présent* presents new playing techniques as an extension of standard flute technique: he focuses on alterations of timbre and pitch, lists other kinds of sound (*autres sonorités*) and gives a detailed fingering chart for multiphonics and *glissandi* (Artaud and Geay, 1995).

More recent publications include a book by Carin Levine and Christina Mitropoulos-Bott – *The Techniques of Flute Playing* (Levine and Mitropoulos-Bott, 2002) – and informational websites by flutists who are specialized in contemporary music: for instance, Matthias Ziegler (2016), Helen Bledsoe (2016) and Rogier de Pijper (2016). Since extended techniques have become standard in the repertoire, the aim here is to give performers and composers pedagogical tools and clear explanations on the realization of each technique. Hence the categorization is more based on aspects of instrumental technique than on the resulting sound. In this regard, websites allow authors to use demonstration videos in order to reinforce their explanations.

Types of musical gestures and techniques

According to Cadoz and Wanderley, there are three types of instrumental gestures. The *excitation gesture* "is the one that provides the energy that will eventually be present in the perceived phenomena". The *modification gesture* "is related to the modification of the instrument's properties" and "affects the relation between the excitation gesture and the sound". Then, the *selection gesture* "consists of a choice among multiple similar elements in an instrument" (Cadoz and Wanderley, 2000, pp. 79-80).

These categories have been applied to the flute by Cléo Palacio-Quintin (2012), who explains that some gestures, such as the choice of a specific fingering, can be considered either as a selection gesture (from the flutist's point of view, who actually chooses the fingering) or as a modification gesture (according to acous-

tics, because two different fingerings will modify the length and structure of the resonating tube). Considering this, we will follow the instrumentalist's point of view and techniques will be taken as selection gestures if they imply a choice *before* sound production begins, and as modification gestures if they are used in order to modify already existing sound parameters.

Starting from these three categories, we will define three types of extended techniques. The first type corresponds to the excitation gesture and thus concerns extended techniques that are related to the sound production mode, which consists of two aspects: the vibrator and the resonator. In other words, it is the way of producing the oscillation that brings the necessary mechanical energy for a sound production, and the kind of resonance that results from activating the air column contained in the pipe (Guillaume, 2006, p. 55). Tongue rams, trumpet sounds and key clicks are possible examples of this first category of extended techniques.

Techniques of the second type take place independently of the sound production mode and can be related to a selection gesture. They are ways of modifying sound parameters that the flutist chooses before the sound production begins. Since modifying duration and intensity of sounds is already a part of the standard instrumental technique, extended techniques of this type will usually have an influence either on pitch, on timbre, or on both of them. For instance, the use of alternative fingerings or timbres belongs to this category.

The third type corresponds to the modification gesture and consists of sound modulations and periodical or aperiodical alterations of a continuous sound. This can be an alteration of pitch, intensity and/or duration, and techniques belonging to this category distinguish themselves from those of the second category by happening during the sound phenomena and by having a constant or repetitive character. A good example would be vibrato, in all its possible variations.

Several instruments in one single flute

While playing, the structure of the instrument itself undergoes very few changes: this happens only if the flutist decides to tune his or her instrument differently (a kind of *scordatura*) or if he or she plays with separate parts of the instrument. But there are several ways of producing a sound vibration on the flute, which corresponds to distinct – often extended – playing techniques. In this regard, the flute can be considered as a multiple instrument, and a special application of the musical instrument classification system by Hornbostel and Sachs (1914) can be an interesting tool to get a portrait of most ways of bringing the instrument into vibration.

As mentioned, techniques that are related to the sound production mode correspond to an excitation gesture. This gesture can be either continuous or instantaneous (Cadoz and Wanderley, 2000, p. 80); both are possible on the flute. Continuous gestures correspond to most cases where the flute is used as an aerophone (when an airstream brings the instrument into resonance); instantaneous gestures usually correspond to the cases where the instrument is used as an idiophone (when the sounds results from a stimulation of the material itself, with its stiffness and elasticity) (Hornbostel and Sachs, 1914, p. 9-18) or as a resonator.

Articulators involved in sound production

For a classification of selection and modification gestures, the concept of *articulator* is used here as an extension of a common notion in phonetics. According to the Collins Dictionary[1], an articulator is "any vocal organ that takes part in the production of a speech sound". In our case, this idea is transferred to the flute; the articulators are all parts of the body whose gestures are determinant in flute sound production and modulation.

As for the voice, most ways of producing a sound on the flute require an airstream, which comes from the lungs, and is controlled through a common action of thorax, abdomen and diaphragm muscles. This airstream passes through the larynx and the mouth, and the degree of tension and the position of vocal articulators (vocal folds, tongue, soft palate, lower jaw) have a direct influence on the sound quality. Then, the airflow is controlled by the lips, which can be considered separately in the context of flute playing, as they are responsible of embouchure control (speed, angle and width of the airflow). Finally, gestures

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[1] Collins dictionary online, Articulator. Found at URL < http://www.collinsdictionary.com/dictionary/english/articulator >, on May 8th, 2016.

from the hands and fingers are directly related to important aspects of sound production, such as the position and the angle of the instrument on the chin, and, of course, the fingerings used.

Results

Classification of excitation gestures

If the flute is mainly used as an aerophone, there are several ways of bringing the instrument into resonance, which can be associated to different kinds of musical instruments. The following classification of excitation gestures is based on categories and subcategories of musical instruments as defined by Hornbostel and Sachs (1914) in their classification system. All numbers in brackets correspond to the Dewey Decimal Classification used by the two authors.

Continuous excitation gestures

When used as an aerophone (4), the flute is mostly a wind instrument and a non-free aerophone (42), which means that the vibrating air is contained within the instrument. In this case, there are two possible subcategories: the flute as an edge-blown aerophone (an actual flute) without duct (421), or the flute as a trumpet (423).

For most standard techniques, as for normal tone, multiphonics, aeolian sounds and whistle tones, the instrument, an actual transverse flute, can be defined as a single open side-blown flute with fingerholes (421.121.12). In some cases, for instance when the instrument is played without the headjoint, the flute becomes an open single end-blown flute with fingerholes (421.111.12). Then, the flutist can also set the air in motion with his or her vibrating lips. In this other special case (usually called "trumpet sounds" or "trombone sounds" by authors and composers), the instrument becomes a side-blown tubular trumpet (423.122), that can also be related to the keyed trumpets subcategory (423.21).

Finally, there are special cases where the flute belongs to other subcategories, or even none of them. Consequently, the technique consisting of setting the air in motion with a vibration of the tongue in the embouchure role could be a special case of the side-blown trumpet. Jet whistles, which consist of blowing directly in the embouchure hole, also belong to the aerophone family, but are rather difficult to classify. In this case, we could mention the unclassified aerophones (43)[2] category.

Instantaneous excitation gestures

In the case of tongue rams (which consist of blowing directly into the embouchure hole and then obstruct the hole with the tongue), the flute becomes a plosive aerophone (413), which playing mode corresponds to an instantaneous excitation gesture: the sound is caused by a single compression and release of air.

Other instantaneous excitation gestures lead to define the flute as a struck idiophone (11). For instance, when used with key slaps, the flute becomes an individual percussion tube (111.231), and part of the percussion idiophones subcategory (111.2).

The flute as a resonator

When techniques such as *pizzicati*, tongue rams without obturation of the tongue or articulations without blowing are used, the excitation gesture takes place outside of the instrument. In those cases, the flute is used as a resonator that amplifies the excitation gesture.

Classification of selection gestures

As mentioned, selection gestures are those where the musician has to choose between several similar elements and will be related to choices made before the sound production begins. With extended techniques, these choices are related to parameters such as pitch and timbre, which are often interdependent. There are two ways of playing on those parameters: by choosing a special fingering, and by choosing a specific embouchure.

Alternative fingering can be chosen to play natural harmonics or get specific spectral qualities (which result in an unusually bright or muted tone, for instance) or to play according to an extratonal or microtonal scale. Embouchure position includes control of parameters such as the angle of the airstream, the degree of covering of the embouchure, and the lip

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[2] Mentioned only in the Wikipedia article on Hornbostel and Sachs's classification system, not in the original article. See Wikipedia, *Hornbostel-Sachs*, at URL < https://en.wikipedia.org/wiki/Hornbostel%E2%80%93Sachs#Struck_idiophones_.2811.29 > on May 8th, 2016.

aperture. All of those will have an influence on pitch and timbre.

Then, when the flute is played as an edge-blown aerophone, the choice of a specific fingering and/or a specific embouchure position will determine if the flutist plays a normal tone, a multiphonic, an aeolian sound or a whistle tone.

Classification of modification gesture

Fingerings and embouchure position can also be changed while playing. In this case, they become parametrical modification gestures, such as when playing glissandi or pitch bends. But most modification gestures will induce a modulation or an alteration– periodical or aperiodical– of the sound. This includes a simultaneous use of the voice and all kinds of modulations.

The usual vibrato, which is similar to the one we hear in the singing voice, is a result of a coordinated action of the diaphragm, the thorax and the abdomen muscles and happens in the glottis cavity (Gärtner, 1981, p. 59). It can be exaggerated and modulated through a control of the diaphragm and the abdominal muscles, or through an exaggeration of the larynx contractions. *Smorzato* is another kind of modulation that can be related to vibrato. It happens through a common action of the lips and the inferior jaw. Pitch, intensity and timbre are modulated through a modification of lip aperture.

The tongue can also induce a modulation in sound quality, by oscillating in the mouth, and while playing with *fluttertongue*. Finally, a fingering change during sound production, such as when playing with *bisbigliando*, will also be considered as a modification gesture.

Discussion

A classification of extended and standard playing techniques on the flute based on the type of musical gesture and on the different ways of playing the flute as an instrument is useful to get a better understanding of factors influencing sound production and sound quality. The relationship between playing techniques and their acoustics and the resulting sound becomes also clearer.

But there are some limitations that come with this classification. First, a flute played with some extended techniques will become a new musical instrument that is hard to describe and classify with the system defined by Hornbostel and Sachs. A good example of this is the jet whistle technique: there is probably no musical instrument that has been invented to be played with this very technique.

Then, the distinction between selection and modification gestures is not always clear, depending on the point of view. We could argue that gestures must be considered from a more holistic point of view. Some gestures associated with specific techniques seem include all kind of gestures: excitation, selection and modification. Also, articulators that modify sound parameters are often used in a common action and cannot always be considered as separate factors of change in sound quality.

Conclusion

Despite its imperfections, this classification based on existing systems such as the musical instrument classification system by Hornbostel and Sachs (1914) and the definition of musical gestures by Cadoz and Wanderley (2000) can find several applications. For instance, it could be used in instrumental pedagogy when teaching extended techniques, in acoustics for a modeling of extended techniques or in studies concerning musical notation in contemporary music.

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Verification and Validation of the Musical Self-Concept Inquiry (MUSCI) to Measure 'Musical Self-Concept' of German Students at Secondary Education Schools

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Abstract

Musical development can be very differently during adolescence and the mechanisms and reasons, which lead to these differences, are often objects of music educational research. To measure the aspects of musical development of German students, the psychometric construct 'musical self-concept' can be used. So the first aim of this study was to verify the factor structure of the initial MUSCI-questionnaire to measure 'musical self-concept' of German students. The second aim was to re-specify the underlying factor model as well as to validate the renewed sub-facets of the questionnaire with music-specific background variables (e. g. interest in 'music') as well as the construct 'musical sophistication'. Data of 516 students (f = 260, m = 251, missing = 5) from three Grammar (n = 382) and three Middle (n = 112) Schools as well as one Junior High School (n = 22) are presented. The data comprised self-assessed 'musical self-concept' and 'musical sophistication' as well as music-specific and demographic background variables. Data analyses included structural equation models (SEM), reliability measurement, and correlational analyses. The re-specified factor model shows a good fit (RMSEA = .040, $\chi 2/df$ = 1.808, TLI = .927 CFI = .941) as well as good subscale reliabilities (α = .635 to α = .799). In order to analyze concurrent validity, the relationships between the re-specified sub-facets of the MUSCI-questionnaire with 'musical sophistication' (r = .113 to r = .567) and music-specific variables (r = .112 to r = .489) were defined. The results demonstrate that the renewed version of the MUSCI-questionnaire can be used to measure 'musical self-concept' of German students.

Keywords: questionnaire survey, musical development, secondary education, musical self-concept, music education

Introduction

Musical expertise, skills and behaviors can develop very differently during adolescence. The reasons and mechanisms behind these differences are often objects of research in music psychology and music education. It is generally assumed that the development of musical skills is integrated into the individual's overall development. Culture and the educational system as well as other things play an important role here (Gembris, 2013). In the past, musical skills as well as abilities, expertise, and competences either were measured with tests that quantify students' musical competences and achievements (e.g. Gordon, 1971), or were measured with aptitude and musicality tests that assess the student's potential for future musical achievement (Seashore, 1919; Bentley, 1968; Gordon, 1989). Furthermore, several longitudinal surveys have investigated the (positive) influence of musical training on non-musical abilities and behaviors, such as intelligence, social behaviors, self-theories, and cognitive effects (e.g. Ho et al., 2003; Schellenberg, 2004). However, in music psychology (and sometimes in music education) studies, the measure of musical skills, expertise, and competence is often simply the participant's amount of instrumental musical training or extracurricular music education. Using such simplified measures neglects the complex and multi-faceted nature of musical expertise, skill, and related behaviour (Gembris, 2013; Hallam, 2010; 2006; Hallam & Prince, 2003). So in contrast, the developed *Musical Self-Concept Inquiry* (MUSCI) by Spychiger (2010, 2012; Spychiger & Hechler, 2014), with its broad conceptualization of *musical self-concept*, provides a much more suitable measurement tool. However, the MUSCI questionnaire was originally developed for the use with adults, and has not yet been validated on younger children respectively on students

in secondary education schools. So in this paper we are testing the assumption that the MUSCI questionnaire by Spychiger (2010) can be used with students at secondary education schools to evaluate the self-reported *musical self-concept* of musically non-active and active students[1].

Self-concept and musical self-concept

"The most general definition of self-concept is 'how one describes oneself' (Harter, 2003, p. 612)" (Spychiger, in press, p. 270). In line with Shavelson et al. (1976), "self-concept is a person's perception of himself. These perceptions are formed through his experience with his environment […] and are influenced especially by environmental reinforcements and significant others" (p. 411). So the "self-concept is inferred from a person's response to situations" (Shavelson, et al., 1976, p. 411). Following the seminal work by Shavelson, et al. (1976) the self-concept presents hierarchically ordered layers and a number of parts. "Layers, as well as their parts, are called *domains* of the self-concept. While the domains within a layer are similar with regard to their formal value, they distinctively differ from one another with regard to their content" (Spychiger, in press, p. 269). This means, that "the first layer distinguishes between the *academic* and the *non-academic* self-concept, and the second between their sub-domains" (Spychiger, in press, p. 269). With this in mind, *musical self-concept* is one part of a person's general self-concept (Spychiger, 2007, 2010). In addition, the term *musical self-concept* is hypothesized to be the psychological structure that turns personal musical experiences into musical identity. Connecting musical identity to musical self-concept sheds light on basic activities of the mind, awareness and consciousness, and on the interactive concept of recognition (Spychiger, in press). So "musical self-concept summarizes a person's answers to his or her inquiries into 'who-I-am' and 'what-I-can-do' questions with regards to music" (Spychiger, in press, p. 268). Above this, *musical self-concept* includes different facets of ideas, perceptions, and assessments – the cognitions – a person has regarding its own musical

activities (Bernecker et al., 2006, p. 53). Furthermore, self-concepts "are important factors in regulating a person's behavior and well-being. […] Self-concepts are the result of a person's self-perceptions, self-appraisals, self-representations, self-evaluations, and finally self-descriptions (Spychiger et al., 2009, p. 1). "If musical behaviour is a door to human consciousness, then individual differences in musical self-concept may shed light on the extent to which and the ways in which one makes use of this door[2], and how important these can be to someone" (Spychiger, in press, p. 283).

Previous Studies

In a multilevel process the construct of *musical self-concept* has been empirically operationalized (Spychiger, 2010) by using different German-speaking samples of adults. "Data were collected first by qualitative methods, interviewing about 70 participants of all social backgrounds, ages, and professional lives. Then, based on the results of content analyses, a questionnaire was gradually developed by quantitative methods" (Spychiger, in press, p. 272). The result of this operationalization process is the MUSCI questionnaire, with its empirically derived multidimensional factor structure, assessing many different elements of musical experiences and musical identity (Spychiger, 2010, Spychiger, in press). The statistical results of the three waves of investigation are 63 items that were selected using reliability and factor analyses. The final questionnaire was named MUSCI, the *Musical Self-Concept Inquiry* (Spychiger et al., 2009), and comprises 12 -subscales, of which 4 scales are to be completed by musicians (students who currently play a musical instrument) only. The MUSCI questionnaire, which is used in this study, to assess *musical self-concept* of musically non-active and active students, comprises the eight factors *Mood Management (S1), Community (S2), Technique & Information (S3), Musical Ability (S4),*

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[1] Students who currently play or don't play on a musical instrument.

[2] "The metaphor of the door may be misleading: it is perhaps more appropriate to think that the 'different doors' are not distinct from one another, in terms of neural structures, perceptions, or actions, but rather that they are interrelated and combined in many ways, according to situational needs and possibilities" (Spychiger, in press, p. 283-284).

Movement & Dance (S5), *Spirituality (S6)*, *Ideal Music Self (S7)*, and *Adaptive Music Self (S8)* (with altogether 43 items) (Spychiger, in press).

Motivation for the application of the MUSCI questionnaire to students at secondary education schools

The operationalization of musical self-concept given by the MUSCI is very important for music educational research, because it provides a measuring tool that is able to represent musical experiences, and assess besides musical education also students' musical identity (Spychiger, in press). These factors generally have a considerable influence on the development of musical competence (e.g. Jordan et al., 2012), on the motivation and interest (Hoffmann et al., 1998, p. 65) e.g. in the school subject 'music' as well as on the development of musical skills, expertise and achievements (Fiedler & Müllensiefen, in press). The MUSCI can also contribute to research in music education and teaching by identifying relationships between adolescents' attitudes towards music lessons as well as its methodical orientation, and by developing models to investigate the influence of personal and socioeconomic variables on the educational music lessons and students' musical achievement (Heß, 2011a).

Aim of the study

The principal aim of this study is to test the MUSCI questionnaire (Spychiger, 2010; in press) developed to measure *musical self-concept* of the adult population, for the use with musically non-active and active students at secondary education schools. Therefore, the MUSCI shall be validated with a sufficiently large student sample. The MUSCI questionnaire, and its corresponding concept of *musical self-concept*, is proposed as an effective universal tool for music education research to evaluate musical experiences and identities (Spychiger, in press). Further aims of this study are to re-specify the underlying factor model as well as to validate the renewed sub-facets of the questionnaire against the Gold-MSI questionnaire (Fiedler & Müllensiefen, 2015; Schaal et al., 2014; Müllensiefen et al., 2014), and to identify relationships between musical, demographic,

and socioeconomic variables (e.g. *self-closeness to the school subject 'music'*, *interest in the school subject 'music'*, and *self-reported marks in 'music'*).

Methods

A. Sample

The sample consisted of 516 students (female = 260, male = 251, not specified = 5) from three Grammar (n = 382) and three Middle (n = 112) Schools as well as one Junior High School (n = 22) across different regions in the south-west of Germany. The average age was 12.78 years (SD = 1.82 years; not specified = 41) with an age range of 9 to 18 years. Concerning the age and types of school as well as teaching groups the sample shows no representativeness.

B. Data collection and measurement instruments

The complete questionnaire was distributed on paper and assessed *musical self-concept* with the MUSCI questionnaire (4-point Likert-scale), *musical sophistication* with the Gold-MSI (7-point Likert-scale), *self-closeness to 'music'* [3] (Kessels & Hannover, 2004; Heß, 2011b), *interest in the school subject 'music'* (Rakoczy et al., 2008), and *self-attribution concerning marks in 'music'* (Rakoczy et al., 2005, S. 164).

C. Data analyses

The data were analyzed using confirmatory factor analysis (CFA) to verify the factor structures of the initial MUSCI and to assess the Factor Reliability (FR) and Average Variance Extracted (AVE). Reliability measurements were employed to determine the internal validity (Cronbach's Alpha), correlational analyses to assess the criterion-related validity, and structural equation modeling (SEM) to re-specify the construct validity of the initial MUSCI questionnaire. Firstly, an analysis of empirically extreme values was conducted to identify outliers. All students (*n* = 533) with a tendency to only tick extreme values (one and seven or one and four) on the Gold-MSI as well as MUSCI questionnaire were identified using the inner-

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[3] Self-closeness is defined „as the extent to which a person uses an object or concept (like a school subject) in ordert o define his or her self (Kessels & Hannover, 2004, p. 130).

fences criterion (MUSCI ≥ 36, Gold-MSI ≥ 30) and were excluded from the data set (n = 17, 3.19 %). This left 516 students in the final dataset used for analysis.

Results

Table 1 outlines the means (M), standard deviations (SD), and ranges of the initial MUSCI scales derived from the students in the sample and documents the respective reliability coefficients plus the additional quality criteria Factor Reliability (FR) and Average Variance Extracted (AVE) (see Weiber & Mühlhaus, 2014) for each MUSCI dimension. The values of internal consistency (or reliability) for the eight initial MUSCI subscales to assess *musical self-concept* of musically non-active and active students generally ranged between α = .710 (α standardized = .710) and α = .844 (α standardized = .845). The exceptions were the subscales *Technique and Information (S3)* and *Spirituality (S6)*, with α = .584 (α standardized = .588) and α = .612 (α standardized = .615), only displaying a satisfactory reliability. All other subscales are within good to very good Cronbach's Alpha ranges. Moreover, the additional quality criteria FR and AVE achieve threshold values recommended in the literature (Bagozzi & Yi, 1988, S. 82; Fornell & Larcker, 1981, S. 46). The intercorrelation of the eight initial MUSCI subscales spanned from r = .123 to r = .496 (see table 2). The confirmatory factor analyses (CFA) of the structure of the initial MUSCI (Spychiger, 2010, 2012; Spychiger & Hechler, 2014) with the German student data set revealed only a satisfactory fit of data and model, with RMSEA = .054 and $\chi2/df$ = 2.52. Furthermore, the CFA showed with TLI = .805 and CFI = .829 also satisfactory incremental fit indices.

On the basis of this only satisfactory fit of data and model, the MUSCI factor structure was re-specified identifying the standardized residual covariance matrix and using AMOS modification indices. In order to re-specify the factor structure variables as well as factors, which do not excellently fit with data and model, were deleted. The factors *Technique & Information (S3)* and *Spirituality (S6)*, which already showed only an acceptable internal reliability (Cronbach's Alpha), were removed. Moreover, the factor *Movement & Dance (S5)*

as well as several variables of the factor *Musical Ability (S4)* were also deleted in the re-specification process. The re-specified MUSCI questionnaire only includes the five factors *Mood Management (S1_new)* with six items, *Community (S2_new)* with four items, *Musical Ability (S3_new)* with five items, *Ideal Music Self (S4_new)* with five items, and *Adaptive Music Self (S5_new)* with four items (altogether 24 items). The re-specified factor model shows a considerably better fit to the data than the original MUSCI model (RMSEA = .040, $\chi2/df$ = 1.81, TLI = .927 CFI = .941) as well as good subscale reliabilities (α = .635 to α = .799). Moreover, table 3 outlines the means (M), standard deviations (SD), and ranges of the re-specified MUSCI scales derived from the students in the sample and documents the respective reliability coefficients plus the additional quality criteria Factor Reliability (FR) and Average Variance Extracted (AVE) (Weiber & Mühlhaus, 2014) for each re-specified MUSCI dimension. Now, the values of internal consistency (or reliability) for the re-specified five MUSCI subscales generally ranged between α = .740 (α standardised = .740) and α = .799 (α standardised = .800). The exception was still the subscale *Community (S2_new)*, with α = .635 (α standardized = .635), only displaying a satisfactory reliability.

In order to analyse concurrent validity, the relationships between each single re-specified sub-facets of the MUSCI questionnaire with *musical sophistication* (Gold-MSI) were analysed. Table 4 shows Pearson correlations between the re-specified MUSCI subscales with the Gold-MSI factors, with significant correlations between r = .113 to r = .567. The moderate to strong correlations between various re-specified MUSCI factors with various Gold-MSI dimensions reveal concurrent validity. This means that dimensions, which show moderate to strong correlation coefficients, are measuring similar latent factors. For example, the MUSCI factor *Mood Management (S1_new)* strongly correlates with the Gold-MSI factors *Active Engagement with Music (F1)* as well as *Emotions (F5)*, because the underlying latent factors are measuring similar dimensions.

Additionally, table 5 demonstrates the concurrent validity (criterion validity) between the MUSCI dimensions with the various on

self- and causal-attribution existing variables *interest in the school subject music (M1)*, *self-closeness to the school subject music (M2)*, and *self-assessed marks in the school subject music (M3)*. The correlations coefficients range from $r = .112$ to $r = .479$, whereas the correlation of the z-standardized total score of the variables *M1*, *M2*, and *M3* (latent variable "school subject music") are between $r = .236$ and $r = .557$.

Discussion

The primary aim of the present validation study was to use the initial MUSCI questionnaire by Spychiger (2010, Spychiger & Hechler, 2014) with students at secondary schools, and thereby to test the multifaceted construct of *musical self-concept* with a heterogeneous sample in a music-pedagogical context, assessing musical expertise and identities in students. The collected data partly confirm the underlying factor structure of the initial MUSCI questionnaire. Moreover, the satisfactory fit indices show that the structural equation models of the factors are partly similar to the adult sample analyzed by Spychiger (2010). In addition, the good reliabilities of the initial MUSCI dimensions – the exceptions were the subscales *Technique and Information (S3)* and *Spirituality (S6)*, with $\alpha = .584$ (α standardized $= .588$) and $\alpha = .612$ (α standardized $= .615$) - suggest that the initial MUSCI questionnaire (Spychiger, 2010) can at least partly be used with students. However, a CFA of the underlying factor structure of the initial MUSCI shows that the questionnaire benefits from a re-specification for the use with students at secondary education. A result of the re-specification process is a new version of the MUSCI questionnaire with altogether 24 items assessing the five MUSCI dimensions *Mood Management (S1_new)*, *Community (S2_new)*, *Musical Abilities (S3_new)*, *Ideal Music Self*

(S4_new), and *Adaptive Music Self (F5_new)* of students at secondary education. Thus, the re-specified MUSCI questionnaire with its broad conceptualization of *musical self-concept* can therefore provide a standardized as well as tested measuring instrument for research in (German) music education that enables the measurement of musical experiences and identities on several different facets with different subscales.

Also, the concurrent validity between the re-specified MUSCI subscales and the captured music-specific and criterion-related background variables demonstrates that various relationships exist between the respective subscales of the re-specified MUSCI and the variables *interest in the school subject 'music' (M1)*, *self-closeness to the school subject 'music' (M2)*, and *self-assessed marks in the subject 'music'* (M3) as well as with the dimensions of *musical sophistication* (Gold-MSI) (see table 4 and 5). Particularly interesting are the significant strong correlations between the re-specified MUSCI subscale *Mood Management (S1_new)* with the Gold-MSI dimensions *Active Engagement with Music (F1)* and *Emotions (F5)*, between the re-specified MUSCI subscale *Community (S2_new)* with the Gold-MSI factor *Active Engagement with Music (F1)*, and between the MUSCI subscale *Musical Abilities (S3_new)* with the Gold-MSI dimensions *Perceptual Abilities (F2)*, *Musical Training (F3)*, and *Singing Abilities (F4)*. These correlations, as expected, show that there is accordance between the similar dimensions (latent factors) measured by MUSCI as well as Gold-MSI. In contrast, weaker correlations were found between the MUSCI factor *Ideal Music Self (S4_new)* and *Adaptive Music Self (S5_new)* with the Gold-MSI subscales *Active Engagement with Music (F1)* and *Emotions (F5)*.

Regarding the further concurrent validities between the re-specified MUSCI subscales and the gathered music-specific variables (see table 5), moderate to strong correlations were found as well. These reveal a relationship between the variables *interest in the school subject 'music' (M1), self-closeness to the school subject 'music' (M2)* and *self-assessed marks in the school subject 'music' (M3)* as

Table 2: Intercorrelations (Pearson) between the inital MUSCI subscales

Scale	S1	S2	S3	S4	S5	S6	S7	S8
S1 (Mood Management)	--	--	--	--	--	--	--	--
S2 (Community)	.463**	--	--	--	--	--	--	--
S3 (Technique & Information)	.229**	.440**	--	--	--	--	--	--
S4 (Musical Ability)	.322**	.529**	.462**	--	--	--	--	--
S5 (Dance & Movement)	.380**	.342**	.123**	.280**	--	--	--	--
S6 (Spirituality)	.342**	.404**	.245**	.260**	.236**	--	--	--
S7 (Ideal Music Self)	.337**	.496**	.633**	.468**	.266**	.279**	--	--
S8 (Adaptive Music Self)	.436**	.396**	.231**	.273**	.314**	.369**	.307**	--

*Note: n = 516, **p ≤ .01 (2-tailed).*

well as the z-standardized total score (latent variable *'school subject music'*) *(M4)* with the

Table 1: Summary of the results of the reliability coefficients as well as the quality criteria (of the second generation) of the inital MUSCI subscales

Scale	n	M	SD	Min	Max	Cronbachs Alpha (standardized)	FR	AVE
Mood Management (S1)	515	3,08	0,61	1,17	4,00	.798 (.800)	.795	.397
Community (S2)	515	2,25	0,63	1,00	4,00	.635 (.635)	.638	.307
Technique & Information (S3)	514	2,55	0,63	1,00	4,00	.584 (.588)	.602	.286
Musical Ability (S4)	515	2,57	0,60	1,11	4,00	.844 (.845)	.841	.352
Movement & Dance (S5)	515	2,50	0,83	1,00	4,00	.824 (.823)	.827	.498
Spirituality (S6)	515	2,12	0,64	1,00	4,00	.612 (.615)	.637	.324
Ideal Music Self (S7)	515	2,56	0,69	1,00	4,00	.799 (.801)	.799	.447
Adaptive Music Self (S8)	513	2,62	0,69	1,00	4,00	.740 (.740)	.736	.412

Note: Measurements of the internal cosistency (Cronbach's Alpha) and the quality criteria of the second generation factor reliability (FR) and average variance extracted (AVE).

particular factors of *musical self-concept*. Along these lines the MUSCI concept includes the cognitive, motivational, volitional, spiritual, and social meanings (Spychiger, in press, p. 284), "which are relevant to a person's identity" (Spychiger, in press, p. 284). In addition, there is a connection between the MUSCI subscales and the *self-closeness to the school subject 'music' (M2)*. These correlations demonstrate that, as Fiedler and Müllensiefen (in press) already showed, the *self-closeness to the school subject 'music'* mediates the effect of the *musical self-concept* (see also Kessels & Hannover, 2004). Moreover, "several structural equation models indicate the relationships between the sub-facets of 'musical self-concept' and 'musical sophistication' with the variable interest in the school subject ['music'] as well as

Table 3: Summary of the results of the reliability coefficients as well as the quality criteria (of the second generation) of the re-specified MUSCI subscales

Scale	n	M	SD	Min	Max	Cronbach's Alpha (standardized)	FR	AVE	Number of items
Mood Management (S1_new)	515	3,08	0,61	1,17	4,00	.798 (.800)	.795	.397	6
Community (S2_new)	515	2,25	0,63	1,00	4,00	.635 (.635)	.638	.307	4
Musical Ability (S3_new)	515	2,49	0,67	1,00	4,00	.778 (.780)	.776	.415	5
Ideal Music Self (S4_new)	515	2,56	0,69	1,00	4,00	.799 (.801)	.799	.447	5
Adaptive Music Self (S5_new)	513	2,62	0,69	1,00	4,00	.740 (.740)	.736	.412	4

Note: Measurements of the internal consistency (Cronbach's Alpha) and the quality criteria of the second generation factor reliability (FR) and average variance extracted (AVE).

relationships with other music-specific and demographic background variables" (Fiedler & Müllensiefen, in press). So "measurements cannot explain the phenomenon, but can make researchers think and give them orientation in many kinds of designs and investigations" (Spychiger, in press, p. 284). With that future research in music education ought to examine the relationships between various variables further and trace the development of students' *musical self-concept* and related factors over the adolescent period.

Tables

Table 4: Correlations (Pearson) between the re-specified MUSCI subscales with the Gold-MSI factors *Active Engagement with Music (F1), Perceptual Abilities (F2), Musical Training (F3), Singing Abilities (F4)*, and *Emotions (F5)*

Scales	F1 (Active Engagement with Music)	F2 (Perceptual Abilities)	F3 (Musical Training)	F4 (Singing Abilities)	F5 (Emotions)
S1_new (Mood Management)	.525**	.334**	.113*	.338**	.567**
S2_new (Community)	.555**	.358**	.316**	.415**	.493**
S3_new (Musical Ability)	.442**	.497**	.546**	.529**	.348**
S4_new (Ideal Music Self)	.409**	.266**	.152**	.285**	.363**
S5_new (Adaptive Music Self)	.351**	.236**	-	.192**	.404**

*Note: ** p ≤ .01 (2-tailed).*

Table 5: Correlations (Pearson) between the re-specified MUSCI subscales with the music-specific background variables interest in the school subject music (M1), self-closeness to the school subject music (M2), self-assessed marks in the school subject music (M3), and the z-standardized total score of the variables M1, M2, and M3 (latent variable "school subject music")

Scales	M1 (interest in the school subject music)	M2 (self-closeness to the school subject music)	M3 (self-assessed marks in the school subject music)	M4 (z-standardized total score of the variables M1, M2, and M3)
S1_new (Mood Management)	.452**	.225**	-	.292**
S2_new (Community)	.479**	.276**	.126**	.391**
S3_new (Musical Abilities)	.515**	.406**	.341**	.557**
S4_new (Ideal Music Self)	.468**	..365**	.112*	.414**
S5_new (Adaptive Music Self)	.293**	.152**	-	.236**

*Note: ** p ≤ .01 (2-tailed).*

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Investigating cognitive mechanisms of social interaction through musical joint action

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Abstract

Contagion, Empathy and Theory of Mind (ToM) are important social cognitive mechanisms that develop gradually in human ontogeny, enabling humans to interact with other human beings in a complex manner. However, the development of cognitive mechanisms for early social interaction is still underexplored. Therefore, the aim of the current paper is to investigate these mechanisms in a broader range from a theoretical as well as empirical perspective. In particular, we propose a music-centered approach, which allows us to investigate cognitive mechanisms of social interaction independently of children's language skills in a musical joint action setting. In our theoretical part, we delineate the social cognitive mechanisms, namely contagion, empathy and ToM. Especially, we suggest emergence of joint attention around nine months in ontogeny as a mile stone of the social cognitive development. Further, we propose that joint attentional skills scaffold empathy and ToM and are necessary to enable complex social communicative behaviors such as joint action. Our empirical part focuses on joint attentional behaviors and explores these in musical joint action of children of different age-groups (1.5–2.5 y; 3–4 y; 5–6 y) by using structured observation of video-recordings. The observation session takes place in a regular lesson of music education for young children, which includes interactive clapping, dancing and other rhythmic and musical gestures under the guidance of a tutor. Results of analyzing indicators of social interactions such as gaze following, mimicry, gestures, and intra- and inter-individual synchronization will be presented. It is claimed that investigating musical joint action provides a new possibility to explore how increasingly complex social cognitive mechanisms emerge in human ontogeny in social communicative behaviors across a wide range of age and adds to current methods in social cognitive neuroscience.

Keywords: Development, Musical joint action, Social cognition, Structured observation

1. Introduction

Almost all of us are familiar with the feeling to get involved in social interaction through music. For example, music may make you dance together with your friends, you could share an aesthetic experience with your partner, or people may play music together in an ensemble. Therefore, in our approach we avoid to reduce music to complex acoustic phenomena as often done in modern cognitive neuroscience of music and consider more important aspect of music, namely social component. Though the relevance of social components over complex acoustic features in music are pointed out by several authors repeatedly (Overy and Molnar-Szakacs, 2009; Cross, 2012), empirical investigations of music as a social domain are still in its infancy. Therefore, the main goal of our current paper is to add to this evolving research area by investigating cognitive mechanisms of social interaction through observing interactive behavior during music making. In particular, we are focusing on the development of social cognitive mechanisms in human ontogeny and their relation to children's ability to interact in a joint musical activity.

Contagion, Empathy, and Theory of Mind (ToM) are cognitive mechanisms that are crucial components to socially interact with other human beings and are claimed to develop gradually in human ontogeny (Bischof, 2008). In the current paper, we concentrate on empathy because it allows us to investigate social interaction in a much broader range than ToM which seems to be in a close relationship with the development of children's language ability (Bischof, 2008). By focusing on empathy, it is possible to explore early social cognitive development in human

ontogeny and social interaction in other domains than language, for example, in the domain of music.

The current paper consists of two parts. In our theoretical part, we first briefly point out limitations of ToM research and propose the concept of "empathy" as more promising for investigating social cognitive mechanisms that underlie joint musical activities which don't rely on language-based communication. Moreover, we relate our findings regarding social cognitive mechanisms to social communicative mechanisms: joint attention is a basis for joint action, i.e. sharing intentions and coordinating intentional behaviors between individuals. In our empirical part, we introduce one method of social cognitive neuroscience, namely observational study, as promising to investigate social cognitive mechanisms in musical interaction. We also present the setting and design of our observational study conducted in a kindergarten during a lesson of music education for young children.

2. Social cognitive mechanisms before Theory of Mind

2.1. Theory of Mind research and its limitations

In general, Theory of Mind (ToM) is the ability to infer on one's own or others' mental states and reflect upon it while being able to clearly differentiate between self and other mental states. ToM as a highly reflexive reasoning mechanism about others' mental states even seems to be uniquely human (Fitch, 2010) and appears around the age of three to four in human ontogeny (Bischof, 2008). However, the development of ToM has traditionally been investigated, for example, through using false belief tests which strongly rely on children's well developed language skills (Bischof, 2008).

The false belief test, first developed by Wimmer and Perner (1983), then modified by Baron-Cohen et al. (1985), had been a standardized task to determine whether infants can infer on other's mental states or not. In this task, also known as the "Sally-Anne test", the children have to understand a story about two characters, Sally and Anne, and reason about the belief of Sally about the position of her hidden object.[1] Regular test results show that children before the age of four years tend to fail this task by giving the wrong answer on where Sally would look for her hidden object. Researchers concluded, therefore, that at the age of four the ability of inferring on other's mental states changes fundamentally (e.g. see Wimmer & Weichbold, 1994).

However, the Sally Anne test requires several demanding subtasks emerging later in the development such as memorizing the right placement of Sally's object or understanding the final key question (Bloom & German, 2000). This test is, therefore, problematic for investigating social cognitive mechanisms in early developmental stages.

2.2. Empathy as a central concept in studying early social cognitive development

Empathy is a broad concept that has been defined very differently in the past. There are still many different definitions of empathy possible, each with its own accentuations and assumptions (Coplan, 2011). Following Coplan's (2011) definition, we propose that Empathy is a complex, high-level cognitive ability to simulate another person's mental as well as affective state, while being able to clearly differentiate between one's own and other's mental state.

2.2.1 Contagion – A primary stage

One approach investigating a primary stage of empathy is based on mirror neuron research. Mirror neurons are a class of motor neurons that were discovered in the rostral part of inferior premotor cortex in macaque monkeys and not only discharge when executing goal-directed actions like hand or mouth movements, but also when observing the same actions (Gallese et al., 1996). Such an action execution/observation matching implemented by mirror systems is often suggested to be

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[1]Sally has an object and hides it in a box (e.g. a red box), and exits the room. While she is outside, Anne takes her object and places it from the red box to another (e.g. a yellow box). After listening this story, the experimenter asks the child where Sally would look for her object when she reenters the room. If the child already has ToM, the answer would be "the red box", but children without ToM would answer "the yellow box" because they fail to infer on Sally's knowledge and use their own one to answer the question.

involved in both sensory-motor and affective experiences such as predicting future action outcomes ("action simulation"; Knoblich & Sebanz, 2008:3) and understanding another's mental states (Gallese & Goldman, 1998).

In action research, the mirror systems are considered to play an important role in low-level mechanisms like motor mimicry (van der Gaag et al., 2007), which is a part of more complex mechanisms like imitation (Decety & Meltzoff, 2011). Imitation differs from motor mimicry: in imitation, agents need to understand the goals and intentions of a particular observed action, rather than just the basic motor movement (Ward, 2012). Development of imitation based on the intentions and goals of an agent can be observed in experiments in infants as young as 12 months (Schwier et al., 2006) and 14 months (Gergely et al., 2002).

Motor mimicry builds a basis of (emotional) contagion, i.e. the tendency to assimilate an affective state (Singer & Lamm, 2009). This mechanism exists early in the ontogenetic development (Bischof, 2008). For example infants that hear the cry of other infants are in return more likely to cry themselves (Simner, 1971), they adopt the affective state of another without separating between one's own and the other's affective state. Just as motor mimicry, this low-level mechanism is innate and uncontrollable by the infant. Because motor mimicry and contagion yield low-level, automatic intersubjective link, they are regarded as the "Big and Little Sisters of Empathy" (Singer & Lamm, 2009) as well as "a basic building block of empathy" (Decety & Meltzoff, 2011, p. 17).

2.2.2. Development of self-other differentiation

In human ontogeny the ability to differentiate self from others develops in a gradual manner. Contagion facilitated by motor mimicry is one of the first observable social mechanism, which doesn't require any separation of one's own and other's mental and affective states (Bischof-Köhler, 1989). The separation can be only achieved by higher levels of reflexivity which emerges in the course of ontogenetic development. The first step is the emergence of the "like me" stance, whereby infants can attribute intentional behavior to others (Decety & Meltzoff, 2011). Infants realize a specific similarity between them and other people, and

transfer their own experiences regarding action-outcome relations to others (Tomasello, 1999). This new ability gets visible through joint attentional interactions such as gaze or point following (Tomasello, 1999). Joint attention marks the beginning of intersubjectivity and thus scaffolds the development of more elaborative social cognitive mechanisms.

The next step of reflexivity enables a clear self-other differentiation in mental and affective states, which is crucial for empathy and gives rise to the sensation of, for example, schadenfreude, i.e. experiencing affective states differing from the other's. To understand the boundaries which distinguish the inner mental states of others from one's own, it is necessary to have an objective view on oneself. Children, up to two years of age, experience their self as the center of own activity (Bischof-Köhler 1989, Bischof 2008). As mentioned above, they are able to attribute intentional behavior to animate objects, by drawing an analogy between themselves and other people (Tomasello 1999). However, not before two years of age this perspective gets extended by the ability to consider the self as an object of representation (Bischof-Köhler, 1989). The development of such a concept of self goes along with the emergence of the ability to recognize oneself in the mirror, i.e. the ability to recognize that 'I' am now identifying 'me' in the mirror (Bischof, 2008).

3. Social communicative mechanisms: Joint attention and joint action

In order to investigate the emerging social cognitive mechanisms as well as the development of self-other differentiation in early social interaction, we need to turn to skills of social interaction which are observable in an empirical setting. Here, we especially focus on joint attention and joint action which, we think, are of great importance in the empirical investigations of social communication and interaction.

Joint attention is a whole complex of skills (joint attentional skills) emerging in human infants between nine to twelve months of age (Carpenter, Nagell, Tomasello, 1998). As mentioned above, the emergence of joint attention is linked to the emergence of the capacity to view other people as intentional agents (Tomasello, 1999) and builds a

significant basis for the further social cognitive development. The infants' behavior shifts from dyadic interactions (i.e. infants' interaction with objects or people) to triadic social interactions (i.e. infants' interaction with people via jointly attended objects). The fundamental skills for this new social behavior includes gaze following, joint engagement, social referencing, imitative learning, directing adults' attention and behavior (differentiating imperative and declarative gestures) (Tomasello, 1999). These skills can be summarized into more general categories of "checking attention", "following attention" and "directing attention", while they are proposed to emerge ontogenetically in this general order (Carpenter, Nagell, Tomasello, 1998).

Joint action is defined as social interactions where individuals coordinate their actions to bring about a change in the environment (Knoblich and Sebanz, 2008). The flexible inter-individual coordination of movements in music can be investigated within four scenarios based on increasingly complex mechanisms of social interactions as introduced by Knoblich and Sebanz (2008). Scenario 1 focuses on "social couplings between 'socially blind' individuals" through entrainment (reciprocal interaction) and simultaneous affordance (interaction through objects which have the same affordance for the actors) (p. 2). Scenario 2 comprises simulation of intentional action in others through perception-action coupling. Mirror neurons are considered to provide a neural basis for the direct perception-action link enabling simulation. Scenario 3 deals with shared perceptions between actors through joint attention and the ability to keep own perception distinguished from another's. Scenario 4 addresses the way to form joint intentionality (intention to act together) in joint action by recognizing the other as an intentional agent, simultaneously distinguishing own intentions from another's, and relating them to each other. The mechanisms involved in these different scenarios differ in the extent to which an intentional process is involved and actors are able to keep their own intentions separated from others'.

Joint attentional skills and joint action is behavior we can observe in an empirical setting. The investigation of joint attentional skills is promising because they act as

fundamental social interactive skills building the basis for higher level cognitive mechanisms like empathy and ToM. In addition, musical joint action is a complex social activity involving many motor and social skills like temporal accurate motor acts for synchronization, imitation, learning, shared understanding, prediction, encouraging eye contact, smiling, laughter and relationship building (Overy & Molnar-Szakacs, 2009). Because different scenarios of joint action reflect the development of self-other differentiation discussed in section 2.2.2., the study of interactive behaviors in musical context may provide near insight into social cognitive development of children.

4. Testing social cognitive ability before Theory of Mind

4.1. State of the art

As pointed out above (see section 2.1.), the classical investigation of social cognitive mechanisms, especially ToM, is using false believe test calling for children's highly developed language skills, which makes it difficult for children before three to four years of age to pass this test. However, as discussed above (see section 2.2.), even children without ToM possess social cognitive mechanisms, which get more reflexive in the course of the development. Those mechanisms such as contagion and empathy enable children to interact with others in a social communicative context, i.e. in a joint action. To investigate this early stage of social cognitive development, it is important to analyze children's non-verbal social behavior. In the following, we review studies examining children's ability to infer on other's mental states, particularly showing the importance of nonverbal communication such as pointing gesture and joint attentional skills like gaze following.

In O'Neill (1996) the subjects, two-year-old children, are introduced to a toy, which is later placed out of reach on a high shelf. There are four trials, two in which the parent can witness the displacement, and two in which the parent cannot. The key task is for the children to ask their parents to retrieve the toy. When the parents were not able to perceive the experimenter, placing the toy out of reach, the children would try to ask their parents for help

(e.g. toy and location naming as well as pointing gesture to location) significantly more often. This result indicates that children, younger than four years old, in fact do have knowledge of other's mental states.

An even more subtle option for examining a child's ability of reasoning about other's mental states is possible by observing gaze length and gaze direction. Onishi & Baillargeon (2005) present a nonverbal false belief task, carried out with 15-month-old children. The researchers examined the children's inferring on other's mental states via gaze duration. As presumed, the children's gaze duration was reliably longer, when the expectation of where the actor would look for the toy, was violated. This result indicates that even 15 months old children infer at least something from other's mental states.

These two studies show how social cognitive mechanisms before ToM can be successfully studied by focusing on non-verbal communicative behaviors. For our study we concentrate on social interaction in a musical joint action setting, therefore analyzing indicators of joint attentional skills like gaze following or body movements. This approach offers the most direct approach to investigate these mechanisms as outlined further below.

4.2. Observational study

The main goal of our study is to draw conclusions on the development of social cognitive mechanisms through observing behavior of non-verbal communicative skills in a musical joint action setting. This will be done through an observational study. Our decision on using observational measurement compared to other measurement methods is based on three benefits of this method outlined by Bakeman & Quera (2012). First, non-verbal behavior which is the main focus of our study is best studied within the context of an observational study. Second, an observational session is proposed to result in more natural behavior by the subjects than in an experimental setting. Third, an observational study enables us to investigate processes. In our case social communicative behaviors that unfold in time. Therefore, observational study facilitates research of social interaction in an ontogenetically broad range including non-verbal children.

The observational sessions take place in the „Fröbel-Kindergarten Regenbogen" (Cologne, Germany) in a regular lesson of music education for young children. Children from the age of 1,5 to 6 take part in our study. Participants are grouped into age-matched groups (1.5–2.5 y; 3–4 y; 5–6 y). Each group consists of four to five children. The environment is well-known to the participating children in so far as they visit this institution on daily basis and they are familiar with both the tutor who conducts the sessions and the room the session is taking place. The participants are also used to the musical content as well as the instruments. The musical content concentrates on rhythmic patterns, motor abilities, and coordination, tested through the following types of exercise. Each session takes 30 minutes.

The observational sessions are recorded with five cameras. One camera placed in each corner of the action space (and the spare one placed behind the tutor) (see figure below).
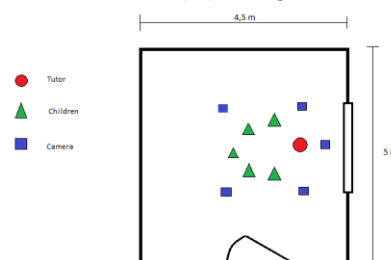
Recorded materials are later coded by using coding schema that define which events are being coded and which categories or distinctions have to be considered (Bakeman & Quera, 2012). The coding schema will be gaze following and interactive behaviors such as imitation and synchronization. The development of motor-skills, language as well as social behavior and interaction is controlled by a standardized questionnaire.

6. Conclusion and future perspectives

Theory of Mind is a well-studied field inside social cognitive science that granted an insight into the social development of children. There is still a problematic and unclear relationship between language and ToM which led us to propose a music centered approach and concentrate on ontogenetically earlier social cognitive mechanisms. Therefore, we put social cognitive mechanisms before ToM like contagion and empathy at the center of our

current paper and emphasized the emergence of self-other differentiation as crucial in the social cognitive development. In order to study social cognitive mechanisms in a broad range, we focused on non-verbal social communicative behaviors, i.e. joint attention and joint action. We hope that through analyzing non-verbal social behavior in our presented observational study using musical joint action stetting, we can draw conclusions on the general development of social cognitive mechanisms before ToM and add to research area of social cognitive neuroscience.

Moreover, the investigation of social cognitive mechanisms within musical joint action could be also applied in autism research. Individuals with autism are known to have deficits in ToM (Baron-Cohen, Leslie, & Firth, 1985) as well as in its putative precursor abilities (Baron-Cohen, 1987). Given the social nature of music, it may be promising to compare children with and without autism in our presented observational study using musical joint action setting.

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Music Performance Anxiety: Can observers perceive anxiety in the performer?

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Background. Music Performance Anxiety (MPA) is known to affect musicians at different levels of their age, gender, experience or hours of practice (Kenny, 2011). Recent studies have shown that anxiety could induce changes in body movements (Craske & Craig, 1984; Endo et al., 2014), and that body movements could affect judgment of the intended emotions of a music performance (Dahl & Friberg, 2007). It has been demonstrated that observers are able to identify intended emotions (e.g. fear) both through visual cues (De Silva & Bianchi-Berthouze, 2004) and auditory cues (Juslin, 2000), and are able to perceive differences between intended emotions and the performer's felt emotion during a musical performance (Van Ziji & Luck, 2013). Since MPA can induce emotional changes in the performers, it is possible that individuals can perceive MPA in the performer through either visual or auditory cues. However, it remains unclear whether different modalities (audiovisual, audio-only & video-only) will elicit differing responses in perceived anxiety.

Aims. The present paper aims to address whether individuals can perceive MPA in the performer under three different modalities (audiovisual, audio-only and video-only), and whether level of music training will result in differences in perceived anxiety ratings.

Method. 8 performers (5 pianists & 3 singers) completed the revised Kenny Music Performance Anxiety Inventory (K-MPAI) and were divided into three anxiety groups (high-anxious, moderately anxious and low-anxious) according to the interquartile range of the total K-MPAI score. The performers were the filmed performing a piece of classical music of their choice in two performance contexts (concert and rehearsal). Excerpts of the performances were presented to 53 observers (24 with less than 5 years of musical training, 29 with more than 5 years of musical training) in three modalities. Observers were asked to rate the excerpts in terms of the performers' internal state on a 7-point Likert scale.

Results. A four-way mixed ANOVA (anxiety level * performance context * modality * musical training) was selected for statistical analysis. Among the results, a significant three-way interaction between anxiety level* performance context* modality, $F (3.51, 178.77) = 6.06$, $p<.001$, $\eta_p^2= .106$ was observed. The results of post-hoc multiple comparisons with *Bonferroni* correction revealed that: 1) the high-anxious performers were perceived as being more anxious in the audiovisual and video-only conditions compared with the audio-only condition, especially under concert setting; 2) the low-anxious performers were perceived as being more anxious in the audio-only condition, regardless of performing contexts; 3) Modality did not affect perceived anxiety ratings in the moderately anxious performers when they performed in the concert, although being able to see and hear the performer elicited lower perceived anxiety ratings than only being able to see the performer in the rehearsal setting; 4) the high-anxious performers were recognized as more anxious than the moderately anxious and the low-anxious performers in the video-only condition; 5) the low-anxious performers were perceived as more anxious than the moderately anxious and the high-anxious performers in the audio-only condition.

Conclusion. The current study provides evidence that anxiety can be conveyed visually to the observers (Craske & Craig, 1984; De Silva & Bianchi-Berthouze, 2004). Furthermore, visual cues seemed to play a more prominent role than auditory cues in assessing the felt emotion (i.e. anxiety) of the performer. Interestingly, the low-anxious performers sounded more anxious than the high-anxious performers. It could be that the musical pieces chosen by the low-anxious performers contained more acoustic elements that signify fear (e.g. staccato articulations; cf. Juslin, 2000) than the ones selected by the

moderately anxious and the high-anxious performers, or this could be a result of the low-anxious performers playing more expressively, and adhering closely to the emotional character of the music. To confirm the current findings, future studies should try to control for other factors that could have affected the observer's ratings, such as the choice of repertoire, gender and the performer's clothing. It would also be useful to investigate what type of non-verbal behavior contributed to the perceived anxiety.

Implications. The current findings provide practical implications for musicians performing in audition settings. Anxious performers may benefit from blind auditions, while non-anxious performers may have the advantage in audition settings where the judges can see the performer. This study also highlights the importance for both musicians and judges to recognize the importance of visual cues in assessing a musical performance.

Keywords: Music Performance Anxiety, Music Perception, Felt Emotion

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Parai mēlam music in Jaffna Tamil culture, Sri Lanka: an ethnomusicological study

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Abstract

Parai mēlam (a double-headed cylindrical drum played with two sticks) music occupies a significant position in Jaffna Tamil culture, Sri Lanka. This is an area which is worthy of scrutiny with regard to its emergence, development, uniqueness, position, performance, changes and continuity. In world drum tradition, *parai mēlam* music tradition has a long historical explanation, but unfortunately this performing art has become a diminishing culture due to various factors. These factors vary in the context of caste, culture and religious, rituals which are key spheres of Jaffna Tamil culture. The major objective of this study is to examine the position and placement of *parai mēlam* music in Tamil culture in the context of changing modern society, what are the structural and cultural consensus for making auspiciousness and inauspiciousness, and how the music rhythms are created, performed, taught, preserved, sustained, and continued? Methodologically, ethnographic research methods including ethnomusicological perspectives and methods have been employed in this study.

Keywords: Parai mēlam music, ethnomusicology, Jaffna Tamil culture, caste, and rituals

Introduction

Parai mēlam (a double headed cylindrical drum played with two sticks) music is, being occupied a significant position in Jaffna Tamil culture, not discussed much ethnomusicologically and anthropologically in the context of Sri Lanka, though it has been contributed immense contribution to the funeral ritual, religious rituals, and the Tamil music culture. *Parai* is an ancient percussion instrument that was played at temple festivals and funerals. This is an area which is worthy of scrutiny with regard to its emergence, development, uniqueness, position, performance, changes and continuity (Valarmathi, 2009). In world drum tradition, *parai mēlam* music tradition has a long historical explanation, but unfortunately this performing art has become a diminishing culture due to various factors. These factors vary in the context of caste, culture and religious, rituals which are key spheres of Jaffna Tamil culture (Sivathamby 2000, 1995).

By exploring the emergence and development of *parai mēlam* music, it brings to light a rich literature background, together with historical significance and the vital role of this percussion instrument in ancient Tamil culture. Furthermore, as this music culture represents the notions of auspiciousness and inauspiciousness, this study further intends to explore anthropologically. Symbolic and cultural expressions of *parai mēlam* are most significant in caste and religious contexts. Though auspiciousness includes Hindu religious pantheon and rituals, performing arts and other fields of music, there is an ambiguity in the notion of auspiciousness while *periya mēlam* music is dominantly mandatory for auspiciousness in the Hindu pantheon of Jaffna.

Due to castetism, ritual pollution (Dumont, 1980; Douglas, 2002 [1966]) and superior consciousness of *pēriya mēlam* music and *karnatic* music (Terada, 2005) this tradition and performers (*paraiyar* community) are seen untouchables and their music untouchable too, but this performance is mandatory for high-caste funeral rites. One of the senior performers (one of my informants) in Jaffna told me that "now our people reluctant to learn this instrument; in particular, the parents do not encourage children to learn this music or become a performer, and parents encourage their children to educate and join in the government service, because the parents and children do not want to continue their occupation (drum player) as it creates low status of identity in the society."

With regard to the auspiciousness and inauspiciousness of this music, there are some drumming rhythms that are identified as inauspiciousness as they are associated with funeral observances. Though auspiciousness includes Hindu religious pantheon (Terada, 2005) and rituals, performing arts and other fields of music (Jeyakantha, 2005), there is an ambiguity in the notion of auspiciousness while *periya mēlam* (music of *thavil* and *nāthaswaram*) [1] music is dominantly mandatory for auspiciousness in the Hindu pantheon (Terada, 2005). Seemingly, there are some drumming rhythms that are identified as inauspiciousness as they are associated with funeral observances. Basically, in Jaffna, *parai mēlam* music is identified as inauspiciousness as it is, in particular, commonly performed for funeral ritual of high castes in Jaffna Peninsula. However, *parai mēlam* performers are from the *paraiyar* caste community, which is from the *panchamar*[2] caste category of caste base social organization in Jaffna.

"Structural replication" and "downward displacement" (McGilvray, 1983) and "pollution" and "purity" (Dumont, 1980) have characterized the nature of inauspiciousness of *parai mēlam* music and performers. With respect to performing this music, performance is varied due to the regional differences, application of rhythms, improvisation, religious and non-religious contexts. Though *parai mēlam* music tradition has a long historical explanation, unfortunately this performing art has become a diminishing culture due to various factors. These factors vary in the context of caste, culture and religious, rituals which are key spheres of Jaffna Tamil culture.

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[1] *Periya mēlam* ensemble consists of four types of instruments:
nāthaswaram (a double-reed aero phone), *thavil* (the double headed drum), *tālam* (a set of two small hand cymbals) and *sruti petti* (the free instrument to provide the drone). See also, Yoshitaka Terada, Performing Auspiciousness: *Periya mēlam* in South Indian Marriage Ceremony.
[2] *Panchama*r includes five low castes namely *ampattar* (barbers), *paraiyar* (drum beaters), *pallar* (labors), *nalavar* (toddy tapers and labors), and *vannan* (washerman) are treated as untouchables in Tamil caste culture in Jaffna, Sri Lanka, see also K. Daniel (1982) *Panchama*r.

Aims

To study the position and placement of *parai mēlam* music in Tamil culture in the context of changing modern Jaffna Tamil Hindu society, what are the structural and cultural consensus for making auspiciousness and inauspiciousness?

Methods

Methodologically, this study is an empirical one and I have used ethnographic research methods such as participant observation, semi-structured interviews, and key-informant interviews. Also, the ethnomusicological perspectives and methods were employed in this study, which derived qualitative data from the fieldwork conducted among the *paraiyar* community at different villages in Jaffna. Participant observation, key informant interviews and case study methods were used in order to assess the peculiarity and uniqueness of the music and life tradition of a particular caste in Tamil culture. In addition, extensive secondary information was also utilized

Results

An ethnomusicological study of *parai mēlam* music is a valuable contribution to the development of Tamil musicology because existing literature has stressed the lack of research in this musical tradition. Moreover, it demonstrates the similarities and differences between *parai mēlam* and other drum musical traditions in the world. In order to further this music, documentation, innovation, comparison with other drum instruments and making improvisation and introducing as a discipline in a performing art school are needed to be done for its furtherance.

Parai mēlam is identified as an ancient Tamil music instrument, which is dated back to Sangam period (300 BCE - 300 CE). The *parai* was used, as a communication instrument, to announce important messages to people during the *Chēra, Chōla*, and *Pāndiya* dynasties periods; at the same time, it was also played at weddings, rituals, and temples. In Sri Lanka, *parai* drum is played by *paraiyar*, thus, drumming castes are known as the *paraiyar*. In addition, *paraiyar* are in the low strata of the caste hierarchy in Jaffna. They provide domestic service to the high caste *vellālar*; thus, *paraiyar* were dealing with

cremation activities, cleaning activities (mensuration and toilet cleaning) and providing music service for funeral.

In particular, as they involve in polluting activities, they were not allowed to enter the temple by of high castes of Brahmins and *vellālar* in Jaffna. Further, as *paraiyar* provided music service for funeral of high caste people in Jaffna, their ritual service was considered an inauspicious ritual service. Therefore, both *parai mēlum* and *parai mēlum* music are dishonored as impure. Thus, *parai* percussion instrument became an identity of *paraiyar* community.

With regard to *parai* performance, *parai mēlum* music is performed in different contexts such as funeral and temple rituals. Furthermore, these two contexts create different spaces which construct different status for this music. Although this music possesses these different kinds of uniqueness, *parai melum* is perceived as a funeral drum (*setha vēdu mēlum*) rather than temple *mēlum*. In the ritualistic context, *parai mēlam* music was performed at the non-*āgama* temples and this music was given to the deities of *kaali, vairavar,* and *amman*, therefore, this percussion instrument was partly associated with this ritualistic tradition.

However, due to the Aurmuganavalar's Tamil and *Saiva* revival movement, non-*āgama* temples and non-*āgama* ritual practices (particularly animal sacrifice) were criticized. Furthermore, this music culture greatly associated with non- *āgama* temples and rituals. This, further, limited its excellence and development. As a result, this reformation heavily supported the *vellālar* caste to dominate performing art culture in Jaffna. Further, *parai* music is just identified as impure music or inauspicious music, but dominant performing art culture of Jaffna failed to capture the aesthetic value of *parai* music. Also, many people have analyzed this music in a context of ritual, i.e. either funeral ritual or temple ritual, but they have not analyzed it as a performing art.

Exploration of emergence, evolution and development of *parai mēlam* music bring to light its rich literature background, its historical significance and its vital role in ancient Tamil culture which communicated

various events. In the *Sangam* period, *parai* was a popular *muzhavu* (percussion) instrument for religious, rituals, and communication purposes (Valarmathi, 2009). Although *parai* is described as an ancient instrument, this music became inauspicious in Tamil culture. But, interestingly, this study found that though parai music identified as an inauspicious music, certain ritualistic contexts, i.e. animal sacrifice rituals, and temples, i.e. *Selva sannithi murukan* temple, are honored by parai music. Consequently, uniqueness of this musical tradition acquaints duality of auspiciousness and inauspiciousness in composing rhythms.

Even though, this music distinctly constitutes such uniqueness of auspicious and inauspicious rhythms, the inauspiciousness is always in the forefront among the people of Jaffna. In such a context, among all musical traditions in Tamil culture, it is the only musical tradition that holds dual positions in religious related and non-religious related fields. Due to castetism, ritual pollution, and superior consciousness of *periya mēlam* and *karnatic* music, this tradition and performers (*paraiyar* community) are seen as untouchables. Particularly, performance is varied due to the regional differences, application of rhythms, improvisation, religious and non-religious contexts, *karnatic* and *periya mēlam* music influences.

Conclusion

Symbolic and cultural expression of *parai mēlam* is most significant in caste and religious contexts. In world drum tradition, *parai mēlam* music tradition has a long historical explanation, but unfortunately this performing art has become a diminishing culture due to various factors. Different dialogues and perspectives are built on this tradition and some argue to discourage learning and performing *parai mēlam* while others encourage it. Reputed temples still maintain the tradition in both manual and electronic forms and it is considered mandatory for high-caste funeral rites.

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Are We Really Hearing in Our Heads What We Think We're Hearing? The Role of Audiation in Musical Improvisation.

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Abstract

An important and valued part of the skill of musical improvisation is to be able to play what we hear in our head (audiation). Improvisation is a cognitively demanding activity, involving the production of musical material in real time. This requires the simultaneous involvement and coordination of many different skills, and places demands on working memory, memory retrieval, auditory and sensory-motor systems. Some recent studies support a cognitive model of improvisation which posits the deployment of stored rhythmic and melodic patterns via motor programmes. According to the theory of event coding, actions and their perceptual consequences share the same cognitive representation and behavioural and fMRI studies have offered evidence supporting this theory. Since musical actions have sounds as perceptual consequences and sensorimotor coupling is bidirectional, this is compatible with improvisers imagining the sounds as they play them. However, phenomenological accounts and interview studies suggest musicians use different strategies to generate ideas in improvisation, such as music-theoretic ideas and motor patterns or 'muscle memory'. So questions remain regarding the precise role of audiation in improvisation: what is musicians' experience of musical imagery as they improvise? Is auditory imagery cognitively prior to action or post hoc? How accurate is auditory imagery? What proportion of musical output involves audiation and how sensitive is this to context? The aim of this paper is to offer a coherent explanatory framework for improvisation from the perspective of cognitive psychology and to propose experimental paradigms to begin to answer some of these questions. On the basis of a review of the literature, it is concluded that two approaches offer a way forward: altered auditory feedback (AAF) and a blocking paradigm in which interference conditions seek to disrupt the tonal loop in working memory.

Keywords: Audiation, improvisation, common coding, altered auditory feedback, tonal loop

Introduction

'Audiation' is a term coined by Edwin Gordon (1979) and in this context it means imagining the music being improvised. Musical improvisation is a complex human activity which also has different meanings in different contexts and resists easy definition. The focus in this paper is on jazz improvisation in a tonal context which is a process involving the composition or selection and deployment of musical material in real time.

Improvisation has proved difficult to investigate experimentally, due to the involvement of many rapid simultaneous cognitive processes and its inherent unpredictability. Some progress has been made in this area recently however, using methods such as computer analysis of solos (Norgaard,

2014), algorithmic generation (Norgaard, Spencer, & Montiel, 2013; Pachet, 2012), behavioural experiments (Goldman, 2013) and fMRI (Donnay, Rankin, Lopez-Gonzalez, Jiradejvong, & Limb, 2014; Limb & Braun, 2008).

Brain scanning techniques (fMRI, EEG, MEG) have also been used to investigate auditory imagery (audiation) in other contexts, such as silent score reading (Brodsky, Kessler, Rubinstein, Ginsborg, & Henik, 2008) and in comparison to perception (Schaefer, Desain, & Farquhar, 2013). However, questions remain regarding the role of audiation in the improvisatory context because the brain regions hypothesized to be involved in imagery overlap with those involved in perception and motor planning (Zatorre & Halpern, 2005), which are also integral to improvisation. How accurate

and how detailed is audiation? When does it occur in the process?

Also, interviews with artist-level musicians indicate that they use a variety of strategies for idea generation when improvising (Hargreaves, 2012; Norgaard, 2011). Some of these, such as 'muscle memory' or strategies based on music-theoretic considerations do not seem to necessitate audiation. So, what proportion of improvised musical output requires audiation and how sensitive is this to context? In order to make progress in addressing these questions experimentally, a cognitive-scientific frame of reference is required (Goldman, 2013).

A cognitive-scientific approach

Pressing (1988) proposed a cognitive model of improvisation in which musical output is seen as a series of 'event clusters', each comprising a group of notes preformed via the triggering of a stored motor program. Action monitoring occurs through the use of both feedback and feedforward mechanisms. Recent studies have offered some support for this model (for a review, see Beaty, 2015).

Furthermore, the theoretical perspective of common coding paradigms, such as the Theory of Event Coding (Hommel, 2009) offers a coherent and evidence based explanatory framework within which the instantiation of Pressing's model can be situated. From the common coding perspective, actions share neural codes with their intended perceptual consequences and this is consistent with improvisers having an aural image of phrases they play.

Action control is achieved by anticipation of the sensory consequences of motor programs once selected (forward model) or these programs can be selected on the basis of the intended sensory consequences (inverse models). Together with the use of auditory feedback for error correction, these mechanisms constitute the feedback and feedforward aspects of Pressing's model. These mechanisms are not mutually exclusive and their relative importance in the improvisation process bears on the questions posed regarding the role of audiation.

Tonal Working Memory

Another important theoretical perspective involves the role of working memory (WM) in audiation. In addition to the phonological loop component of WM proposed by Baddeley and Hitch (1974), recent studies have found evidence that musicians use a 'tonal loop' for the processing of non-verbal auditory imagery (Schulze & Koelsch, 2012; Schulze, Zysset, Mueller, Friederici, & Koelsch, 2011; Yu et al., 2015). Some of the brain areas involved (for example Broca's area and the premotor cortex) are hypothesized to have a role in the planning and control of actions (Schulze et al., 2011) and this is consistent with brain plasticity in musicians facilitating sensorimotor coupling through practice.

These theoretical perspectives suggest two experimental approaches that could make progress in elucidating the role of audiation in improvisation.

Methods

The first approach involves the use of altered auditory feedback (AAF) in conjunction with electroencephalography (EEG). This approach has been used to investigate action control in musicians (Lutz, Puorger, Cheetham, & Jancke, 2013; Maidhof, Vavatzanidis, Prinz, Rieger, & Koelsch, 2010; Pfordresher, Mantell, Brown, Zivadinov, & Cox, 2014), but this author is not aware of any studies which have used it in the context of improvisation.

In the proposed study, participants would be required to improvise monophonically to a backing track. The auditory feedback would be subject to pitch manipulations and EEG data captured. The hypothesis is that a feedback related-negativity FRN would be elicited at about 250ms (Lutz et al., 2013) only in the presence of accurate audiation of what participants improvise. The musical conditions such as tempo and harmonic complexity of the backing, as well as the nature of pitch manipulations could then be varied.

The second approach uses a blocking paradigm (Brodsky et al., 2008). Participants will be required to improvise normally and also under interference conditions designed to either use the resources of tonal working memory (humming a familiar tune), or to use different resources while representing a similar cognitive loading (e.g. reciting digits). The hypothesis is that tonal working memory is required for audiation. If the nature of the improvisations produced were to differ significantly when the use of tonal working memory is blocked, this

would give support for the use of audiation during improvisation. Quantitative measures such as entropy and pitch class distribution (Goldman, 2013) and qualitative measures such as expert rating could be used to assess musical output.

Results

At the time of writing there are no results available as the experiments are still being developed.

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Musical Feedback: a new strategy in gait training for Parkinson's Disease Patients

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Abstract

Rhythmic auditory stimulation (RAS) for gait training in Parkinson's disease has been applied successfully over the last three decades.
The purpose of this study is to investigate the effectiveness of an extended concept of RAS, which is not limited to musical stimulation, but also includes musical feedback.
In our study the comparison between RAS, musical feedback (MF), and no musical stimulation (NM) is conducted on a sample of 20 idiopathic Parkinsonian patients in a randomized cross-over design. Each patient has the task to walk for six minutes for each condition, focusing on stride length. The patient is instructed to make long steps and is connected with a software that is able to record stride length and cadence. In the RAS condition the patient listens to music with clearly accentuated rhythm. In the MF condition, as the stride length increases, the same musical piece used in the RAS condition goes through five different levels, ranging from a simple beat to a complete orchestral sound. The software records the percentage in which every music level is covered, with higher levels corresponding to longer strides.
Our preliminary results confirm the expectation that MF facilitates stride length increase in a faster and more stable way than RAS does.

Keywords: Gait training, Parkinson, Musical feedback, RAS

Introduction

The use of acoustic stimulation for the rehabilitation of gait disorders in Parkinson's disease (PD) has been developed in the 1990s under the concept of rhythmic auditory stimulation (RAS). The available literature supports its effectiveness systematically (e.g. Thaut 1996, Benoit 2014, Mainka 2015). RAS consists in a clear accentuated rhythm that can be either a simple metronome or a beat embedded into music, and is able to stimulate the production of rhythmical movements.

Patients suffering from idiopathic PD are unable to steadily generate regular steps on their own due to an impairment of the basal ganglia, but are able to couple external (especially acoustic) stimuli with the production of regular steps. Thus, over the last three decades, the use of RAS has become a standard protocol in the neurologic music therapy for gait training in Parkinson's disease.

Thaut and colleagues proved the effectiveness of musical RAS on Parkinson's patients (1996) and suggested that the musical texture may provide additional timing information to the beat embedded into it, and may therefore facilitate detection, anticipation, and synchronisation to the beat in a more effective way than a simple metronome does (1997). Moreover, music facilitates emotional involvement and motivated engagement in a task and might therefore be a more efficient stimulation than the dry metronome beat.

Based on these premises, we explore the effectiveness of two different kinds of musical stimulation on Parkinsonian gait.

We use functional music with a clearly detectable beat (RAS) and we compare it with an extended version of the concept of RAS, in which a sensory-based musical feedback responds directly to the patient's stride length - the main goal of our gait training protocol. To date, musical feedback has not been investigated in Parkinson gait training and could offer a valid integration for the traditional RAS protocols.

Methods

20 idiopathic PD patients take part in the study in a randomized cross-over design. All patients are recruited in the Neurological Hospital for Movement Disorders / Parkinson's of Beelitz-Heilstätten, Germany. The recruitment responds to the following criteria: Hoehn and Yahr ≤ 3; clinically manifest gait slowdown in on (UPDRS III, Item 29 = 1); no neurological or psychological comorbidity; no freezing episodes in the last half year; no RAS therapy in the last three days.

The experimental examination is conducted one hour after dopaminergic medication and lasts about one hour overall. First of all, two assessments are conducted. In the first, the patient is asked to walk at normal, comfortable speed for 20 steps. If his cadence is equal or greater than 112 bpm (beats per minute), the patient is excluded from the study, since such a cadence can be indicator of freezing or festination, both phenomena that would confound the outcome of the study. Otherwise, with cadence lower than 112 bpm, the patient continues with the second assessment, in which he is asked to walk speedy for 20 steps. Basing on this second assessment, the goals of the whole experiment are set: stride length is increased by 6% and cadence is set to the nearest value among the following: 95, 100, 106, 112, 118, 125 spm (steps per minute).

Once the goals are set, the patient performs three walks in a randomised sequence, each with a different acoustic stimulation: 1) only verbal commands with no musical stimulation (NM) (control condition); 2) functional music (RAS) with verbal commands; 3) musical feedback (MF) with verbal commands.

Each experimental condition consists of five minutes' stimulation and one final minute carryover, which allows to check whether the effect of the stimulation continues also right after the music has stopped. Between one walk and the following there is a ten minute wash-out phase.

The musical stimulation consists in an instrumental piece based on well-known German folk music, with a steady tempo corresponding to the set walking cadence.

In RAS condition the piece is played for five minutes without changes, while in MF the same musical piece ascents (or descends) through five levels depending on the patient's stride length, with higher levels rewarding him for making longer strides. The levels have a different, increasingly rich instrumentation: the first one has only bass (ensuring the presence of a clearly detectable beat all through the piece), in the second the piano accompaniment comes along, in the third come the drums, in the fourth come flute and French horn playing the melody, and in the fifth high timbered bells complete the orchestration.

For the whole duration of the experiment the patient wears two sensors fastened to each shoe and connected to a software, which measures in real time stride length and cadence. In the MF condition the software also reproduces the five musical levels depending on stride length. Otherwise it is used only for the measurement, in silent mode, while music or verbal commands are played through an extra MP3-player.

Moreover, the patient is asked four closed questions (two right after the MF walk and two concerning the whole experiment), in order to collect additional data for the interpretation of the measured parameters.

Results

Our preliminary results show that musical feedback facilitates stride length increase in a faster and more stable way than RAS and NM do. The mean stride length measured during the MF condition is greater than the corresponding value in the RAS and NM conditions.

Discussion

The focus of the present study is to compare the effects of two different kinds of musical stimulation, namely musical RAS and musical feedback, on gait training in PD, and thereby determine whether sensory-based feedback is more effective than classical RAS. Giving the patient an immediate feedback, MF steadily encourages him to reach the training goal. We suggest that MF activates a loop between perception and action and thus operates on a fast, nearly automatic level.

The study is still in progress and might undergo small changes as well as give different results as the ones collected so far. However, our preliminary results encourage further research on the role of musical

feedback as a therapeutic device and may therefore pave the way for a new trend of musical stimulation.

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Effects of coaching on generalist primary music teachers´ classroom practice and their `musical self-concept´.

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Abstract

The majority of music lessons in primary schools are covered by generalist primary music teachers, usually with little or no training in teaching it. This practice-based research project is part a PhD program to professionalize generalist music teachers in primary schools to teach music lessons. The aim of this study was to describe changes in the generalist primary music teachers´ didactic classroom practices in teaching music. Moreover, this study aimed to analyze the generalist primary music teachers´ development of their `musical self-concept` (Spychiger, 2010). This longitudinal intervention study is qualitative in character. Participants were 8 generalist primary music teachers and 4 specialist primary music teachers (control group). The 8 generalist primary music teachers were divided into two groups. The first group (n=4) received four coaching sessions (group 1), the second group (n=4) received four coaching sessions and 56 hours of further education in music didactics (group 2). The control group received no special treatment. The individual coaching sessions for all generalist primary music teachers (group 1 and 2) followed the `Content Focused Coaching` (CFC) concept. Empirical data were collected before the beginning and at the end of the study by video-observations of classroom performances in primary music lessons (n=24), and questionnaires concerning the teachers `musical self-concepts` (n=24). The first findings seem to suggest on the one hand that generalist music teachers require fairly little support to enhance their didactic performance of teaching music in primary music lessons. But on the other hand it appears that coaching without a parallel measure of further education seems to be to no avail for the group of less musically trained generalist music teachers.

Keywords: video-based research, generalist, primary school music lesson, musical self-concept, coaching

Introduction

This practice-based research project is part of a PhD program to professionalize generalist music teachers in primary schools to teach music lessons. It was commissioned by the music staff of the University of Education Freiburg, Germany. The aim of this study was to describe changes in the generalist primary music teachers´ didactic classroom performances in teaching music. Moreover, this study aimed to analyze the generalist primary music teachers´ development of their `musical self-concept` (Spychiger, 2010).

Generalist teachers of music in primary schools

In Germany specialist primary music teachers cover only up to 20% of all primary school music lessons (Hammel, 2011). The majority of music lessons in primary schools are covered by generalist primary music teachers, usually with little or no training in

teaching primary music lessons. In fact, the knowledge base regarding the generalist primary music teachers´ didactic performances and their current practices of music teaching is very limited. It is suspected that in generalist music lessons only singing is practiced with the students every once in a while (Schellberg, 2005, p. 81). The conclusion drawn to this situation is that students´ development of musical competencies is nothing that can be expected under these circumstances (Schellberg, 2005, p. 81). Only very few things are known about professional development of generalist music teachers. The overall situation in German music education research is that it is not known for certain, what is taught, how it is taught and what effects arise from it (Lehmann-Wermser & Krause-Benz, 2013, p.7).

Although teacher training measures seem to have effects on generalist teachers´ practices in teaching music the extent of such influence has not received much study. A quantitative

study among generalist primary university students was able to show that (self-reported) self-confidence and musicality in teaching music were raised and inhibitions to teach music were lowered after participating in a preparatory music course for generalists at university (Schellberg, 2016). Generalist music teachers´ confidence in teaching music has an influence on the perception and appraisal of their music teaching practices. This common pattern among generalist music teachers was found in a quantitative study by Hammel (2011). The generalist music teachers played down their own music teaching practices and did not give it the recognition it deserved, because they compared their individual musical skills to that of specialist music teachers and professional musicians (Hammel, 2011) and thus remained in a rather under-confident state of mind with their role as music teachers. The reported situation of German generalist primary music teachers is comparable to international research reviews to the greatest possible extent. Although the advantage of generalist music teaching is emphasized on the one hand, namely that it "could help improve the image of music among teachers as well as children" (Mills, 1989, p. 126). International reviews of music teaching in primary schools on the other hand conclude with appeals like "music-specific professional development is urgently required for generalist classroom teachers currently in schools." (Pascoe et al., 2005, p.6). An English study on primary music teaching results that "the amount of time dedicated to music in most Initial Teacher Training courses is inadequate to create a workforce [among the generalist music teachers] that is confident in its own ability to teach the subject in the classroom." (Henley, 2011, p. 35). The main problems generalist primary music teachers face are less musical training and low confidence in teaching music. Therefore professional development of generalist primary music teachers should provide musical training and promote confidence in teaching music. International research points out coaching of generalist primary music teachers as an important factor for professional development to promote confidence in teaching music (Pascoe et al., 2005, p.6; Hassel, 1999, p.33, 98). It seems reasonable to assume that teachers´ musical self-concepts and their own musical training affect the

quality of didactic performance and instruction in primary music lessons.

De Vries states in a qualitative Australian study that generalist music teachers achieved high self-efficacy through "mastery teaching experiences […], verbal persuasion from parents, teachers and school principals, and to a lesser degree vicarious experiences that focused on involvement in professional development experiences" (de Vries, 2013, p. 375). Consequently a professional development has to focus on the real needs of generalist teachers in their teaching practice situations in the primary music classroom to build up confidence in teaching music. Professional development that included coaching could fill the gap between general further education measures and the generalist teachers´ need to apply the new knowledge to their individual situations in their music lessons.

Musical self-concept of generalist primary music teachers

The instrument to measure the generalist primary music teachers´ musical self-concept is named the `Musical Self-Concept Inquiry` (MUSCI) (Spychiger et al., 2009). It comprises eight sub-scales to research and evaluate musical identities and experiences with music. The 8 sub-scales altogether consist of 43 items: *Mood Management* (MUSCI 1), *Community* (MUSCI 2), *Technique and Information* (MUSCI 3), *Musical Ability* (MUSCI 4), *Movement and Dance* (MUSCI 5), *Spirituality* (MUSCI 6), *Ideal Music Self* (MUSCI 7), and *Adaptive Music Self* (MUSCI 8) (Spychiger, 2010). The MUSCI questionnaire uses a Likert scale with steps 1 to 4. The sub-scales operationalize the questions `who-I-am` and `what-I-can-do` relating to the social, cognitive, physical, spiritual and emotional aspects of music. In addition to these 5 non-academic sub-domains there is one academic sub-domain with regards to music skills.

Video analysis of generalist primary music teachers` classroom practices

To identify these teachers´ current practices in teaching musical activities to students a video-based study has been piloted. The focus was in observing generalist teachers´ teaching practices regarding the active involvement of

students with rhythm, melody and playing instruments. Other musical activities such as listening, dance and movement, production and composing have been excluded from this study. How do generalist music teachers practice music in their classrooms? To answer this question 4 practice conditions derived from the music theory of the `verständige Musikpraxis` (Kaiser, 2001) were applied to the video-analysis. `Verständige Musikpraxis` means *informed music teaching* and aims at making students aware and knowing of what they are practicing. The 4 practice conditions are: (1) requesting students to participate and counting them in (*counting in*); (2) modeling and imitation of the teacher while *practicing music*; (3) disturbances, and all kinds of interruptions that pause the flow of practicing (*interruption*) and (4) sharing feedback, praise and comments on the students musical performance (*feedback and guidance*).

Moreover sharing responsibilities and increasing learner autonomy is envisaged in the *informed music teaching* theory. To gain insights in the level and amount of provided teacher support to the students another 3 categories were added to the video-analysis: verbal, nonverbal and musical support. To represent to which extend the piloted video-data correctly measured the categories an interrater-reliability test (Wirtz & Caspar, 2002) was carried out with 3 raters on 3 videos. The interrater-reliabilities for the *informed music teaching* practice and the didactic teacher support were good to very good. Cohen´s kappa ranged between kappa = .876 and kappa = .982 (see *Table 1*).

Coaching concept for generalist primary music teachers

The individual coaching sessions for all generalist primary music teachers (group 1 and 2) were structured according to the guidelines of the *Content Focused Coaching* (CFC) concept by West & Staub (2003). An adaptation for generalist music coaching was created that used forms of pre-, while- and post-lesson coaching inputs. Pre-lesson coaching inputs were observing the teacher before the coaching begins and collaboratively planning the music lesson (West & Staub, 2003). While-lesson coaching inputs could occur in 3 basic formats: the coach teaches the lesson (or parts of it), coteaching or the

generalist teacher of music teaches the lesson (West & Staub, 2003). The post-lesson coaching could consist of a postconference following a script for structured coaching interviews and in some cases of stimulated recall methods to incorporate video-sequences from the generalists´ own music lesson (Meade & McMeniman, 1992; Blomberg et al., 2011). Each generalist primary music teacher was coached four times during that schoolyear. A coaching session lasted 63 minutes on average. The 8 generalist primary music teachers of group 1 and 2 were coached by 3 trained coaches. The 3 coaches were experienced specialist primary music teachers who also were involved in teacher training courses.

Methods

This longitudinal intervention study is qualitative in character. Research took place in the schoolyear 2014-2015 in 10 primary schools in South Germany. Participants were 8 generalist primary music teachers and 4 specialist primary music teachers. The 4 specialist primary music teachers served as a control group and received no special treatment. The 8 generalist primary music teachers were divided into two groups. The first group of generalist primary music teachers (n=4) received four coaching sessions (group 1), the second group of generalist primary music teachers (n=4) received four coaching sessions as well and 56 hours of further education in a period of 14 weeks (group 2). The further education measures focused on music didactics in classroom performances (Shulman´s PCK) (Shulman, 1986), group singing lessons and song accompaniment on guitar.

Empirical data were generated before the beginning (pre) and at the end of the study (post) for coaching sessions, music lessons and the musical self-concept. Coaching sessions (n=16) with 8 primary generalist music were videotaped and analyzed according to the *qualitative content analysis* method (Mayring, 2014a, 2014b). Video-observations of music lessons (n=24) were analyzed with regards to the *informed music teaching* practices that primary music teachers performed in their music lesson with their students. The methodological approaches to the video-analyses combined *event-sampling* and *video-*

based micro-ethnography (Reh, 2012; Rauin et al., in press). Data focusing the primary teachers´ musical self-concepts (n=24) were collected from 4 specialist primary music teachers and 8 generalist primary music teachers by using MUSCI questionnaires. The data of this small sample (n=12) was summarized with basic descriptive statistics (Bühner & Ziegler, 2009). Additionally 3 music coaches who visited the generalist primary music teachers in their schools and 3 video-raters participated in the study, but no empirical data was generated in these groups.

To be able to measure possible coaching effects and changes on the generalist music teachers classroom performance it was necessary to test whether the video-instrument will be able to detect differences in teaching practices between the specialist music teachers (control group) and generalist music teachers (group 1 and group 2). An excerpt of the analysis of the video-based pilot study is presented in which 3 primary music school lessons given by 3 different teachers (group 1, group 2 and control group) are examined for correspondence between practicing music with students, counting them in, interrupting them and giving them feedback and guidance (see *Table 2*). In addition, the video-analysis examined how primary music teachers supported their students´ musical learning during periods of musical practice. The video-analysis investigated which kind of supportive teacher actions -verbal, nonverbal and musical- occurred during a primary music school lesson to assist students' practical music learning (see *Table 3*). The video analysis measured the duration of each event in every category in percentage of a 45 minute primary music lesson[1].

Results

The findings of the video-analysis of the pilot study show that the specialist primary music teacher performs differently than the 2 generalist teachers of music. The specialist primary music teacher practiced 44,3 % of the

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[1] Only a part of the data can be presented at this point. The analyses of coaching sessions and the `musical self-concept´ scales have been excluded.

time in a music lesson and gave *feedback and guidance* to the students for 13% of the time in a music lesson (see *Table 2*). The 2 generalist teachers of music practiced music for much shorter times than the specialist music teacher (group 1 for 21,9 % and group 2 for 35,7 % of the time). The 2 generalist teachers only spent little amounts of time to give their students *feedback and guidance*. The same difference is shown in the phase of *counting the students in* and preparing them to practice. The generalist music teachers spent almost no time (group 1 with 0,1 % of the time in the music lesson) to very little time (group 2 with 2,7 % of the time in the music lesson) on *counting them in*, compared to the control group with 5,7% of the time. The times measured off-task and not practicing music, because of *interruptions* (e.g. disciplining or organization of instruments) is high for one generalist music teacher (group 2 with 20,9 % of the time in a music lesson) and low with the generalist teacher of group 1 (8,7 % of the time), compared with the specialist music teacher, who interrupted music practice for 10,7 % of the time. In total the phases: *counting in*, *practicing music* and *feedback and guidance*, which can be regarded as useful to establish an *informed music practice*, are the highest for the specialist teacher (63 % of the time in a music lesson), compared with 23,8 % (group 1) and 43,4 % (group 2) of the time in a music lesson (see *Table 2*). The phase *interrupting* has been excluded from the total, because it does not attribute to a good teacher performance in the way it is seen by the *informed music practice* (Kaiser, 2001). Patterns and durations of supportive teacher actions differ between the 3 groups. The specialist music teacher supports the students´ music practice best with 75,6 % of the time in a music lesson, while the generalist music teachers support their students for 40,9 % (group 1) and 41,3 % (group 2) of the time. Interestingly enough the generalist teachers did not show any (group 1 with 0 %) or only little (group 2) verbal and nonverbal support for their students´ music practice (see *Table 3*).

Discussion

On the one hand it seems that generalist music teachers require fairly little support to enhance their didactic performance of teaching music in primary music lessons (see *Table 2*), because the duration of the phases *counting in*

and *feedback and guidance* could be (easily) increased by drawing the generalist teachers´ attention to it, for example by coaching. But on the other hand generalist music teachers seem to require significant support to enhance their pedagogical content knowledge (PCK) (Shulman, 1986) and their diagnostic awareness of dealing with students' musical learning problems (KCS) (see *Table 3*). It appears that coaching without a parallel measure of further education seems to be to no avail for the group of less-musically trained generalist music teachers. Although, coaching could assist the generalist teachers´ professional development, it seems unlikely that without further education and workshops on topics like leading, instructing, supporting and understanding students´ musical learning processes, the generalist teachers will be able to learn and apply these competences to their teaching practice in their own music classrooms.

Conclusions

From this pilot study no final conclusions can be drawn, because the results are only based on a very limited number of video-based data from primary music lessons in German schools. The music teaching practices were examined focusing the performance of singing and playing instruments. For future professional development research on general primary music teacher it would be advisable to assess various areas of their teaching practices to obtain a full description of their abilities. Further research efforts could focus on forms, styles, tempo etc. of teaching practices and include other musical activities such as listening, creating, moving and rhythmic activities. For future generalist music teacher education and professional development it would *still* be recommended to raise their confidence in teaching music (Mills, 1989) and to sharpen their awareness of their guiding role as a music teacher. Teacher training facilities should support generalist primary music teachers´ professionalization in these fields. Furthermore general primary music teacher development could be enhanced by offering a variety of measures during every phase of the teacher education that may include coaching and stimulated video recall.

Tables

Table 1. Pilot study: Interrater reliabilities for 3 music videos of 3 primary music teachers by 3 video-raters.

didactic performance and didactic teacher support	Cohen´s kappa	% agreement
counting them in	.957	98,6
practicing music	.982	99,1
interrupting	.940	97,7
feedback and guidance	.954	98,3
verbal teacher support	.886	98,6
nonverbal teacher support	.876	98,3
musical teacher support	.937	99,1

Table 2. Pilot study: Comparing 3 primary music teachers´ phases of their didactic classroom performances focusing music practice in % of the music lesson.

didactic teacher practice	control group (n=1)	group 1 (n=1)	group 2 (n=1)
1. counting in	5,7	0,1	2,7
2. practicing music	44,3	21,9	35,7
3. interrupting	10,7	8,7	20,9
4. feedback and guidance	13,0	1,8	6,4

Total (1.,2.,4.)	63,0	23,8	43,4

Table 3. Pilot study: Comparing 3 primary music teachers´ patterns of supportive behavior while practicing music in % of the music lesson.

didactic teacher support	control group (n=1)	group 1 (n=1)	group 2 (n=1)
verbal	8,2	0	2,9
nonverbal	17,3	0	3,2
musical (e.g. singing, playing an instrument)	50,1	40,9	35,2
Total	75,6	40,9	41,3

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How Important is the Reproduction Technique for the Perception of Spaciousness in Music?

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Abstract

Sound fields are preferred when spaciousness is perceived. "Spaciousness means that auditory events, in a characteristic way, are themselves perceived as being spread out in an extended region of space". The author's former study (2012) investigated the perception of spaciousness of five musical genres. Participants evaluated spaciousness while listening to music with loudspeakers. Resulting, these genres allowed classifications of spatial features such as "big", "wide" and "open". A new idea of conducting listening tests has arisen using wave field synthesis instead of headphones. Firstly, this study aims to reveal the perceptional characteristics of spaciousness in music itself with headphones, loudspeakers and wave field synthesis. Secondly, it will find the differences of perception when participants listen with headphones, loudspeakers and wave field synthesis. Thirdly, this study's goal is to investigate the possibility of replacing headphones with wave field synthesis for listening tests. A hearing test has been conducted asking 28 participants for their spacious impression. The Participants rated 30 music excerpts on a 7 Point-Likert-Scale from "little spacious" to "much spacious". Dummy head measurements for an objective comparison were made. 3x3 ANOVA repeated measures revealed a significant Within-Subject effect for the technical devices (F = 4.541, p < 0.05), different instrument groups (F = 71.281, p < 0.01) and also for the interaction technical devices-instrument groups (F = 7.700, p < 0.01). The kind and number of music instruments on the one hand and the reproduction technique on the other hand influences the perception of spaciousness.

Keywords: Music Perception, Psychoacoustics, Spaciousness, Acoustics, Wave Field Synthesis

Introduction

Listeners prefer sound fields when spaciousness is perceived (Blauert and Lindemann, 1986). "Spaciousness means that auditory events, in a characteristic way, are themselves perceived as being spread out in an extended region of space" (Blauert 1997, p. 348). According to Winckel (1970), spacious sensation occurs when timbre features a high ratio of low frequently energy. A dependence between sound level and spaciousness has been found but has not been "investigated quantitatively enough to be included in the index of spaciousness" (Blauert 1997, p. 355).

The spaces experienced while listening to music are distinguished by Wellek (1982). He separates the physical space from psychological space. Blauert (1997) introduces a model about the auditory information processing of spatial hearing. It consists of three different aspects: the physical, psychophysical, and the psychological aspects.

The author's former study (2012) investigated the perception of spaciousness of the musical genres Classic, Ethno, Electro, Jazz and Rock. Participants evaluated spaciousness represented by twelve adjectives while listening to 30 music excerpts for each genre with loudspeakers. Resulting, these genres allowed classifications of spatial features such as "big", "wide" and "open" (Stirnat, 2012).

Loudness as a related subjective parameter of sound level is a very subjective size differing throughout participants. Von Ruschkowski (2013) found a significant difference in the loudness perception among others between male and female participants. As size and shape of a head and ears vary between participants, every participant has a different head related transfer function (HRTF), which "characterizes how a particular ear (left or right) receives a sound from a point in space" (Potisk 2013).

When conducting studies with technical devices, the technical features have to be considered. They give sounds a certain characteristic and quality. If the quality is low,

distortions appear quickly for example. Thus, features as the driver, the frequency response and the radiation are important cues (Kleiner, 2012). A complex frequency response describes the response characteristics of the amplitude along the frequency spectrum and phase (Friesecke, 2007). Headphones measurements have shown that the way of wearing headphones influences the frequency response up to approximately 20dB especially for low frequencies (Kleiner, 2012).

In order to avoid this issue, a new idea of conducting listening tests has arisen using wave field synthesis instead of headphones (e.g. Laumann, Theile and Fastl (2008)).

Firstly, this study aims to reveal the perceptional characteristics of spaciousness in music itself with headphones, loudspeakers and wave field synthesis. Secondly, it will find the differences of perception when participants listen with headphones, loudspeakers and wave field synthesis. Thirdly, this study's goal is to investigate the possibility of replacing headphones with wave field synthesis for listening tests.

Therefore, the following hypotheses have been formulated:

- Music specific characteristics will occur referring to the perceived spaciousness.
- The headphones, loudspeakers and wave field synthesis will be perceived differently and reveal specific characteristics for the used technical devices.

Experiment

Methods

A listening test was conducted at the wave field synthesis laboratory at Hamburg University of Applied Science (HAW) in July 2015. Participants were asked to rate how spacious they perceived music excerpts on a 7-Likert-Point-Scale.

Participants

28 participants took part in this study. The data of one participant had to be excluded because a technical problem occurred during one session. The other 27 participants were 19 to 62 years old (mean age = 30,59 years, SD = 12.87).

According to their answers, 18 participants had had experiences in hearing tests and 26 were normal listeners without any diagnosed hearing impairment. 21 participants had attended musical training at least at amateur level.

Stimuli

30 music excerpts of various anechoic recorded instruments were used. Each music excerpt was 15 seconds and was played once for each stimulus with 5 seconds silence (15s music – 5s silence). The stimuli were either self-recorded in the anechoic chamber of the Institute of Systematic Musicology or elsewhere recorded in an anechoic environment (Bernschütz et. al, 2012; Bang & Olufsen, 1992). When necessary they were faded out at the end of the stimulus. Various kinds of instruments were chosen for a variety of stimuli: guitar, banjo, flute, oboe, e-piano, violin, cello, accordion, vocals, trumpet, and brass. They were played either solo, in a duet or in an ensemble.

Setup

Each participant sat at the same listening position for all three listening conditions (see *Figure 1*). They listened through Beyerdynamic DT100 2x400Ω headphones, two professional A8X loudspeakers and Fouraudio Wave Field Synthesis Model 28-243 with 26 (loudspeaker) modules including 26 loudspeakers for each module (more information in Fohl, 2013; Nogalski, 2012). The Wave Field Synthesis modules surrounded the listener position (top row in Picture 1 and the loudspeakers were located in front of it.

Figure 1. The listening test's setup

A tracking system was used for the wave field synthesis condition so that the music was heard near the grey sensors above the head (see

Figure 2). The participants wore it as shown on the picture. Infrared cameras detected the sensors so that the music excerpts were reproduced by the loudspeaker modules as set in the software "xWonder". Here, a headphone-alike setup was chosen that made the music excerpts being heard near the grey sensors above the head.

Figure 2. The tracking system used in the wave field synthesis condition on the dummy head.

Procedure

At the beginning the participants were introduced to the experiment and were asked to answer some background questions about e.g. sex, age, experiences with listening tests. Before the start of the listening test they could ask any questions in case something was unclear. Their task was to rate music excerpts on how spacious (from 1="little spacious" to 7="very spacious") they perceived them.

The participants listened to all 30 music excerpts in three conditions in a random order. One third of the participants started with the headphones condition, one third of the participants heard through wave field synthesis first and the others began with the loudspeakers condition. The 30 Music excerpts were played in random order for each condition as well. The order within one condition remained the same for all participants.

The first two music excerpts were always pre-testing excerpts so that the participants could get used to the task and the listening conditions. The volume level was set on a quite equal level which was tested by listening as there was no absolute decibel display. The whole experiment took between 30 and 45minutes. As a little reward the participants received a small gift for their participation.

Data Analysis

The music excerpts were categorized into groups by their number and kind of musical instruments in order to decrease the α-Error by reducing the data. Therefore, similar music excerpts were summarized into the groups *wind instruments with one voice, stringed instruments with one voice* and *mixed instruments with several voices*. 3x3 ANOVA-repeated measures was carried out in order to analyze the data in respect to the hypotheses. Two factors with three levels each were chosen: *TechnicalDevices* and *InstrumentGroups* Bonferroni was used as adjustment for multiple comparison. Additionally, the stimuli's frequency spectrum and sound level was checked using the software Audacity.

Results

The overall means by condition are shown in *Figure 3*. The headphones condition reveals a mean value $\bar{x} \approx 4.08$, the wavefield synthesis condition a mean value $\bar{x} \approx 4.49$ and the loudspeakers condition a mean value $\bar{x} = 4.191$.
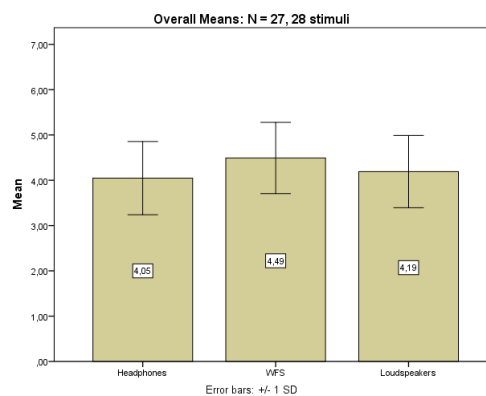
Figure 3. Overall means by condition for spacious perception of 28stimuli for N=27.

This result shows that the wave field synthesis condition was rated the highest, the headphones condition the lowest and the loudspeaker condition in between. The mean values of each stimulus point to the same tendency. The mean value of the wave field synthesis condition is higher than the mean value of the headphones condition in 23 cases.

The tendency was checked for significance analysing the data with 3x3 ANOVA-repeated measures. Therefore, three instrument groups were used:

Wind instruments – one voice:

In *Table 1*, the headphones condition reveals the lowest mean value $\bar{x} \approx 2.96$ with a standard deviation $SD \approx 0.92$, followed by the loudspeakers condition with a mean value $\bar{x} \approx 3.42$ and a standard deviation $SD \approx 1.03$. The highest mean value has the wave field synthesis condition with $\bar{x} = 3.75$ and a standard deviation $SD \approx 1.03$.

Descriptive Statistics

	Mean	Std. Deviation	N
Headphones_WOV	2,9636	,91669	27
Wave field synthesis_WOV	3,7500	1,07473	27
Loudspeakers_WOV	3,4213	1,03145	27

Table 1. Mean values and standard deviation of spacious perception for wind instruments one voice (WOV) by condition.

Stringed instruments – one voice:

Here, the mean values are higher than those of the wind instruments (see *Table 2*). The loudspeakers condition shows the lowest mean value $\bar{x} \approx 4.06$ with a standard deviation $SD \approx 0.93$. The headphones condition has a mean value $\bar{x} \approx 4.11$ in the middle of the other conditions with a standard deviation $SD \approx 1.05$. Again, the wave field synthesis condition reveals the highest mean value $\bar{x} \approx 4.57$ with a standard deviation $SD \approx 1.01$.

Descriptive Statistics

	Mean	Std. Deviation	N
Headphones_SOV	4,1173	1,04984	27
Wave field synthesis_SOV	4,5679	1,01196	27
Loudspeakers_SOV	4,0593	,92516	27

Table 2. Mean values and standard deviation of spacious perception for stringed instruments one voice (SOV) by condition.

Mixed instruments – several voices/polyphony:

These mean values are higher than those of the wind instruments and stringed instruments (see *Table 3*). The headphones condition reveals the lowest mean value $\bar{x} \approx 4.63$ with a standard

deviation $SD \approx 0.94$, followed by the loudspeakers condition with a mean value $\bar{x} \approx 4.75$ and a standard deviation SD ≈ 0.79. The wave field synthesis condition has the highest mean value $\bar{x} \approx 4.82$ with a standard deviation $SD \approx 0.84$.

Descriptive Statistics

	Mean	Std. Deviation	N
Headphones_MISV.P	4,6337	,94019	27
Wave field synthesis_MISV.P	4,8189	,83669	27
Loudspeakers_MISV.P	4,7490	,79444	27

Table 3. Mean values and standard deviation of spacious perception for mixed instruments several voices/polyphony (MISV.P) by condition.

As the Mauchly test is not significant for *TechnicalDevices* and *InstrumentGroups* sphericity is assumed. The interaction *TechnicalDevices*InstrumentGroups* is significant with *p < .05* so that sphericity is not assumed but Greenhouse-Geisser value (ε < .75). A significant Within-Subject effect was found for *TechnicalDevices* (F = 4.541, p < .05), *InstrumentGroups* (F = 71.281, p < .01) and also for the interaction *TechnicalDevices*InstrumentGroups* (F = 7.700, p < .01). Estimated Marginal means confirm this result and reveal the factor levels showing the effect. *Headphones* and *wave field synthesis* reveal a significant (p < .05) mean difference of d = .47. *InstrumentGroups* shows a significant effect for all three levels. *Wind Instruments-One Voice* and *Stringed Instruments-One Voice* have a significant (p < .01) mean difference of *d = 0.87*. *Wind Instruments-One Voice* and *Mixed Instruments-Several Voices* show a significant (p < .01) mean difference of d = 1.36. *Stringed Instruments-One Voice* and *Mixed Instruments-Several Voices* have significant (p < .01) mean difference of *d = 0.49*. *Figure 4* displays the Estimated Marginal means and makes the interaction between the variables obvious. The distance between the *InstrumentGroups* variables varies for all three conditions which indicates an interaction effect for all instrument groups and listening conditions (Janssen & Laatz, 2013). It means that the instrument groups have an impact on the perception in the listening condition and vice versa.
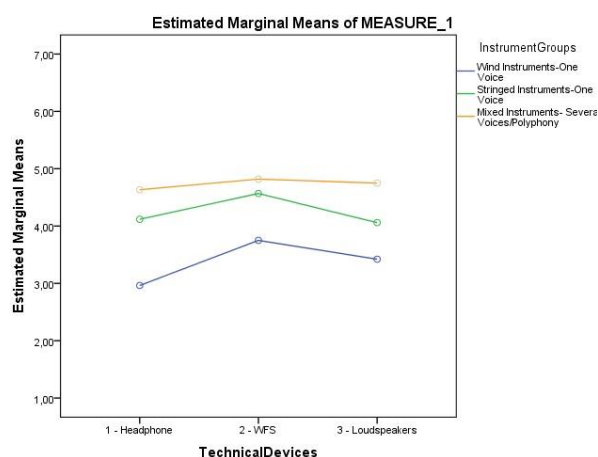
Figure 4. Estimated marginal means for the three instrument groups and the technical devices: blue line shows wind instruments, green line stringed instruments and orange line mixed instruments.

The frequency spectrum and sound level of the stimuli was checked using Audacity. A low amount of low frequency was seen for five of eight wind instrument stimuli. But the amount of low frequency was higher for stringed instrument stimuli and for mixed instruments stimuli. Comparing the overall sound levels of the stimuli with the average ratings revealed that the stimuli of the same instrumentation showed a link between sound level and rating if the level difference was at least 6dB. Thus, the stimuli with an at least 6dB higher sound level was rated more spacious. This link should be investigated more in the future.

Objective Measurements

Dummy head recordings were made in order to better understand and explain the results of the listening test. A dummy head is a normed head including two microphones at the positions of a head's ears. The one used for these measurements was a HEADacoustics dummy head.

Firstly, the reproduction accuracy of wave field synthesis' tracking system was tested with sinus waves in nine different positions (see Figure 5). From 62,5 Hz to 8 kHz sinus waves were played for 5sec. each with 1sec. silence between each frequency. The frequency was raised octave wise.
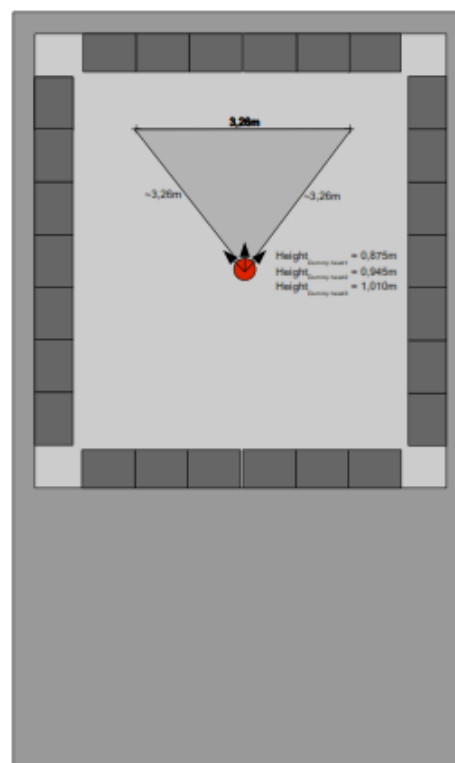
Figure 5. Draft of the measurement setup in the wave field synthesis laboratory using a HEADacoustics dummy head in nine different positions.

The overall sound pressure level shows the reproduction accuracy at a listener's position. The differences between both microphones of the dummy head range from 1,25 dB[V] up to 3,71 dB[V] within one of nine positions. Comparing the positions within on microphone the maximum difference for the left microphone is 3,93 dB[V] and for the right microphone 3,99 dB[V]. This result means that a difference in the sound level is audible for a listener and not exact the same within the listening area.

Another dummy head measurement has been done recording the music excerpt in the listener position for every condition but the data analysis is still in process and will be added as soon as the analysis is finished.

Discussion

The significant results of the listening test show that not only the reproduction technique is an important factor but also the kind of music used. On the one hand the wave field synthesis condition is perceived higher than the headphones condition. On the other hand

characteristics for the instrumentation of the music were found. Several mixed instruments are perceived more spacious than single stringed instruments and single wind instruments are perceived even less spacious. These findings match with the analysis of the frequency spectrum quite well, as stimuli with a higher amount of low frequency were rated more spacious and confirm Winckel's (1970) result. Also the sound level analysis indicate a link between sound level and perception of spaciousness as Blauert (1997) wrote

Dummy head recordings of the wave field synthesis system revealed fluctuations of max. 3,99dB[V] in the SPL arriving at the listeners ear which are smaller than the differences of approximately 20dB in the frequency response of different types of wearing headphones by Kleiner (2012) as the dummy head recordings did not measure the whole frequency response of the wave field synthesis. But these results indicate a more accurate reproduction technique than headphones for investigating spaciousness and other research areas where the sound level matters.

Conclusions

The hypotheses were confirmed in this study and even an interaction effect between the technical devices and the instrument groups was found. The sound level has turned out to be an important factor for spaciousness and gives a reason for replacing headphones with wave field synthesis. The results just mentioned indicate that the reproduction technique is one cue among several others for the perception of spaciousness. Thus, it is important to use appropriate reproduction technique for the desired sound. But it is also important to consider that reproduction alone influences the perceived spaciousness as well as the kind of music. Both aspects have an impact on the perceived spaciousness, too, leading to a different perception than both aspects separately.

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Social effects of interpersonal synchronization during listening to music compared to a metronome: What can we learn from implicit measures?

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Abstract

Interpersonal coordination, such as simultaneous rhythmic movement, is a fundamental way to form socioemotional connections. The social and emotional power of music might further strengthen such interpersonal bonds. Here, we tested if interpersonal synchronization (synchronous vs. asynchronous finger-tapping) affects sympathy and helpfulness more strongly when listening to music compared to a metronome. We tested 40 participants and used an explicit and an implicit measure to assess their social orientation toward a tapping partner (i.e., one of two experimenters). Participants directly rated the friendliness of the experimenter on a 9-point Likert scale. As a more indirect or implicit measure of social orientation, we counted the number of pencils (out of a total of eight) that the participants collected after the experimenter "accidentally" dropped them. After five seconds, the experimenter started to help the participants or collected the pencils herself. Results of the pencil test showed that participants were more helpful toward an experimenter who tapped synchronously compared to asynchronously. Importantly, this result was completely driven by the effect of interpersonal synchrony during listening to music. When listening to music, participants collected 38 pencils ($M = 3.80$, $SD = 3.29$) after tapping in interpersonal synchrony compared to only 13 pencils ($M = 1.30$, $SD = 2.67$) after tapping asynchronously. No such effect was found for the metronome. The results of explicit ratings of the experimenter's friendliness, however, did not confirm these effects. The direct ratings might have been more strongly influenced by social desirability or related motivational distortions. Since music is a product of social interactions and might even be the result of evolutionary adaptation, we conclude that especially during listening to music, interpersonal synchrony or asynchrony can fulfill or violate hard-wired social expectations. Additionally, we could show that implicit or indirect measures can help elucidate how music, movement and prosocial behavior are connected.

Keywords: social entrainment, interpersonal affiliation, joint action, sensorimotor synchronization

Introduction

Interpersonal coordination – be it behavior matching, such as mimicry, or interactional synchrony, such as simultaneous rhythmic movements (e.g., Bernieri & Rosenthal, 1991) – is a fundamental way to form socioemotional connections. Here, we addressed the question how synchronous and asynchronous finger-tapping with another person during either listening to music or a metronome influences sympathy and prosocial orientation.

Behavioral mimicry, interactional synchrony and music

Behavioral mimicry describes the mirroring of another person's gestures, postures or other movements (e.g., speech gestures, foot shaking; for a review, see Chartrand & Lakin, 2013). Factors that increase the tendency to mimic the behavior of another person include prosocial attitudes (Leighton, Bird, Orsini, & Heyes, 2010), being in a good mood (Likowski et al., 2011), and the likeability (Stel et al., 2010) or the goal to get along with this person (Lakin & Chartrand, 2003). In turn, being mimicked can positively affect feelings of liking toward the mimicker (Chartrand & Bargh, 1999), feelings of interpersonal closeness (Ashton–James, van Baaren, Chartrand, Decety, & Karremans, 2007), and prosocial behavior in adults (van Baaren, Holland, Kawakami, & van Knippenberg, 2004) and infants (Carpenter, Uebel, & Tomasello, 2013).

In contrast to behavioral mimicry, that usually includes a time lag of a few seconds, interactional synchrony describes movements that are temporally matched. A variety of research suggests that the interpersonal synchronization of movements, such as walking, pendulum-swinging, chair-rocking, body-swaying, or finger-tapping, promotes

affiliation and prosocial orientation (e.g., Demos, Chaffin, Begosh, Daniels, & Marsh, 2012; Hove & Risen, 2009; Marsh et al., 2009; Reddish, Fischer, & Bulbulia, 2013; Valdesolo & Desteno, 2011; Wiltermuth & Heath, 2009).

By using a moving visual timekeeper, Hove and Risen (2009) showed that the degree of synchrony between the participants' and the experimenters' finger-taps was positively related to how much participants liked the experimenter. Such effects may even be stronger when moving together while listening to music. When rocking in a chair with a partner, the degree of synchronization with music is positively correlated with the feeling of interpersonal connectedness (Demos et al., 2012).

Listening to music has a strong emotional component and, similarly to social bonding, engages the endogenous opioid system (Tarr, Launay, & Dunbar, 2014). Furthermore, rhythmic synchronization in musical contexts represents a special form of social entrainment (Phillips-Silver, Aktipis, & Bryant, 2010), and can provide a controlled yet ecologically valid domain to study social interaction and joint action (Keller, Novembre, & Hove, 2014). In the current study, we tested the hypothesis that interpersonal synchronization affects sympathy and prosocial orientation more strongly when listening to music compared to when listening to a metronome.

Measures of sympathy, affiliation and prosocial behavior

Direct or explicit measures, such as self-reports, are one of the main pillars of experimental psychology. However, they can suffer from credibility issues, are vulnerable to consistency seeking, and depend on the participants abilities to introspectively access the processes that underlie their feelings and behaviors (Paulhus & Vazire, 2005). In contrast, indirect or implicit measures, such as implicit association tests (Greenwald, McGhee, & Schwartz, 1998), affective priming tasks (Fazio, Jackson, Dunton, & Williams, 1995; Fazio, Sanbonmatsu, Poweu, & Kardes, 1986), the seating distance to another person (Holland, Roeder, van Baaren, Brandt, & Hannover, 2004), or the number of collected pencils that another person dropped (Macrae & Johnston, 1998), do not require introspection. This particular characteristic led to the assumptions that implicit measures can reflect unconscious mental representations and are less susceptible to motivational distortions, such as social desirability (for a review and discussion of these assumptions, see Gawronski, LeBel, & Peters, 2007). However, it is important to note that although specific factors can affect implicit measures without affecting comparable explicit measures (e.g., Gawronski & LeBel, 2008), implicit measures do not necessarily reflect unconscious mental representations (Gawronski et al., 2007). Additionally, domain-specific motivational distortions (e.g., the motivation to control prejudice reactions) might be more powerful in explaining differences between implicit and explicit measures than social desirability in general (Gawronski et al., 2007; Hofmann, Gschwendner, Nosek, & Schmitt, 2005).

Various implicit measures have previously been used to assess prosocial orientation in the domains of mimicry and interpersonal synchronization. In a row of chairs, participants who had been mimicked sat closer to a chair with belongings from another person than participants who had not been mimicked (Ashton–James et al., 2007). Being mimicked also increases the likelihood of collecting pencils that another person dropped (van Baaren et al., 2004). Similar tests have been used to show that helpfulness is increased after playing a prosocial video game compared to playing a neutral or aggressive video game (Greitemeyer & Osswald, 2010), and decreased when reminded of money (Vohs, Mead, & Goode, 2006). In a musical context, Kokal, Engel, Kirschner, and Keysers (2011) showed that participants collected more pencils to help a synchronous co-drummer compared to an asynchronous one.

Since previous studies on behavioral mimicry and interactional synchrony successfully assessed affiliation and prosocial orientation with implicit and explicit tests, the current study combined and compared both methods.

Methods

Participants

Forty students of the University of Graz (20 females, mean age $= 23.7$ years, $SD = 2.60$) without musical training participated in the study after providing informed consent.

Design and procedure

Participants were assigned to one of four groups: tapping with a partner who tapped synchronously or asynchronously during listening to music or a metronome. The resulting between-subject design consisted of two independent variables: *interpersonal synchrony* (sync vs. async tapping) and *musical quality* (music vs. metronome).
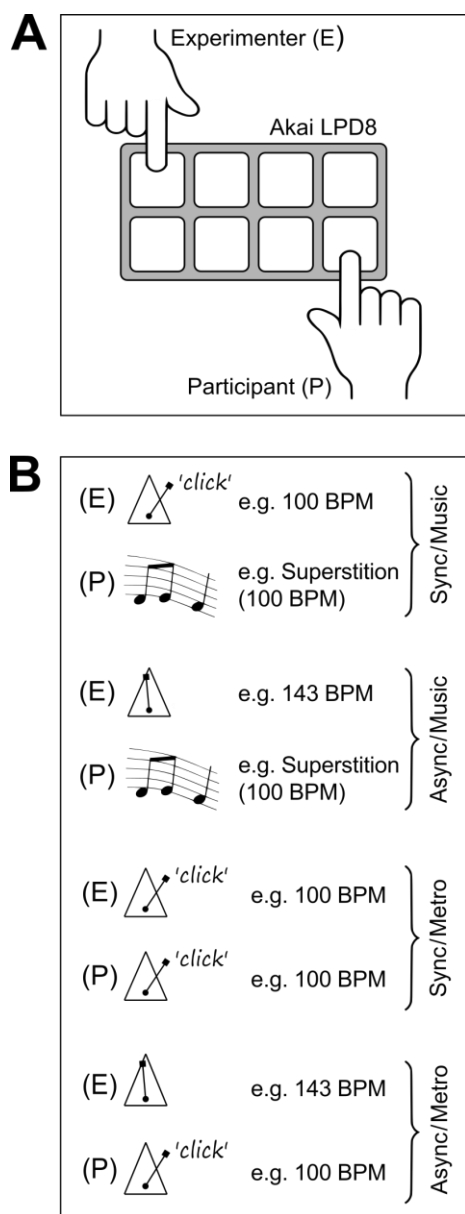

Figure 1. A) Setup for the tapping task. Participants (P) and the experimenter (E) tapped their right index finger on two different pads on the same tapping device (Akai LPD8). Both wore headphones. B) Visualization and examples of the four experimental groups.

Both, participant and experimenter tapped their right index finger on two different pads on a MIDI tapping device (Figure 1A).

Each group of participants (*sync/music*, *async/music*, *sync/metro*, and *async/metro*; Figure 1B) consisted of five females and five males. The tapping partner was one of two female experimenters (psychology students, 22 and 25 years old) who did not know the participants. In the *sync/music* group participants tapped at the music's beat rate and the experimenter tapped at the same rate given by a metronome that was slightly adjusted for minimal tempo changes. In the *async/music* group participants tapped at the music's beat rate and the experimenter tapped at a 30% faster rate given by a metronome. In the *sync/metro* group participants and the experimenter tapped in time with the same metronome. In the *async/metro* group the experimenter tapped with a 30% faster metronome than the participants. Participants were instructed to tap in time with the stimuli and to focus on their own tapping.

Material

Acoustic Stimuli

To facilitate sensorimotor synchronization in the tapping task with music, we used three music clips that were rated high on groove (i.e., highly movement inducing) in a recent study (Janata, Tomic, & Haberman, 2012; see also Stupacher, Hove, Novembre, Schütz-Bosbach, & Keller, 2013; Stupacher, Hove, & Janata, in press; Table 1). A metronome count-in with a length of one measure (4 sounds in 4/4 time) was used to indicate the beat rate. In the metronome conditions isochronous snare drum sounds were presented with the same beat rate as the three music clips. The clips lasted between 31 and 33 seconds, were randomized, and repeated 4 times, resulting in 12 clips in total. Before tapping with the experimenter, participants completed practice trials to ensure that they understood the task. The tapping part of the experiment lasted approximately 8 minutes.

Self-reports

Participants rated their current mood (very bad vs. very good), the friendliness of the experimenter (very unfriendly vs. very friendly), and the interaction with the

experimenter (very unpleasant vs. very pleasant) on a 9-point Likert scale before and after the tapping task. After the tapping task they additionally reported their interest to generally participate in another test run by the same experimenter (no interest vs. strong interest).

Prosocial orientation

After the tapping task the experimenter stood up to get the questionnaires and a cup with eight pencils stored in a cupboard near the participant's chair. She pretended to accidentally drop the pencils and took about five seconds to place the questionnaires on a desk giving the participant enough time to help. Afterwards she started collecting the remaining pencils with or without the participant's help. Prosocial orientation toward the experimenter was assessed by the number of pencils the participants collected.

Results

Tapping data

Inter-tap-intervals (ITIs) were computed by subtracting the absolute time of a tap n from the absolute time of the following tap $n+1$. Doubled or missing taps and outlier ITIs (+/- 2 SD from the mean ITI for each participant and trial) were excluded (5.5%). Mean ITIs indicated that participants tapped at the beat rate of the stimuli (see Table 1). Three separate ANOVAs – one for each tempo – on the mean ITIs with the factors *interpersonal synchrony* (sync vs. async) and *musical quality* (music vs. metronome) revealed no main effects (ps > .07) and no interactions (ps > .17). No main effects of *interpersonal synchrony* and *musical quality* and no interaction were found in an additional ANOVA on the standard deviations of ITIs (ps > .5), indicating that the stability of the tapping rate did not differ between groups.

Self-reports

Chi-squared tests were used for the analysis of self-reports since all variables suffered from a ceiling effect (skewness between -0.50 and -1.93, all Kolmogorov-Smirnov ps < .01). Seven individual tests (for each pre- and post-tapping rating) with the factors *interpersonal synchrony* and *musical quality* on the sum of ratings per cell revealed non-significant results (ps > .5). Main effects of *interpersonal synchrony* and *musical quality* were also non-significant (ps > .2).

Prosocial orientation

Nonparametric tests were used since the assumption of normal distribution was not met. A chi-squared test with the factors *interpersonal synchrony* and *musical quality* on the total number of collected pencils was significant, $\chi^2(1) = 7.16$, $p = .007$. Further comparisons showed that participants collected more pencils after synchronous tapping compared to asynchronous tapping $\chi^2(1) = 5.45$, $p = .020$. This result was completely driven by the effect of *interpersonal synchrony* during listening to music, $\chi^2(1) = 12.26$, $p < .001$ (38 pencils [$M = 3.80$, $SD = 3.29$] after *sync/music* compared to 13 pencils [$M = 1.30$, $SD = 2.67$] after *async/music*, see Figure 2B). No effect of *musical quality* on the number of collected pencils was found, $\chi^2(1) = 1.47$, $p > .2$.

Discussion

We tested the hypothesis that interpersonal synchronization has a stronger effect on sympathy and prosocial orientation when listening to music compared to a metronome. The results of an implicit test confirmed our hypothesis and showed that participants were more helpful toward a person who tapped synchronously compared to asynchronously.

Table 1: Features of the acoustic stimuli used for tapping with music and the corresponding mean inter-tap-intervals (ITI) of participants.

Title	Artist	Meter	Groove rating *	Tempo	ITI in ms (*SD*)
Superstition	Stevie Wonder	4/4	108.7	100 BPM / 600 ms	590.89 (26.49)
Flash Light	Parliament	4/4	105.1	105 BPM / 571 ms	561.28 (27.12)
Look-Ka Py Py	The Meters	4/4	92.5	87 BPM / 690 ms	678.26 (34.84)

* Janata et al., 2012 (MIDI scale from 0 to 127)

Importantly, this was only true when participants tapped in time with music, but not with a metronome. The results of explicit ratings of the experimenter's friendliness, however, did not confirm this effect.
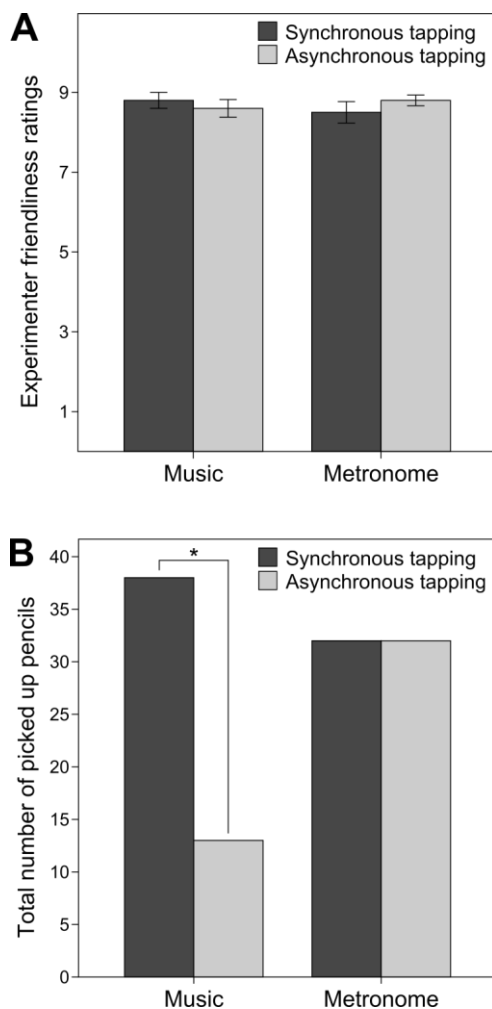

Figure 2. A) Mean ratings of the experimenter's friendliness given by participants in each experimental group after the tapping task. B) Total number of pencils that the participants in each experimental group collected after the experimenter "accidentally" dropped them (* $p < .001$).

Music evokes a variety of emotions, some of them related to attachment and the fulfillment of social needs, such as trust, cooperation or the prevention of isolation (Freeman, 2000; Koelsch, 2010; Vuilleumier & Trost, 2015). This emotional and social power of music might even be the result of evolutionary adaptation (Cross, 2001; Freeman, 2000; Huron, 2001). Compared to non-musical stimuli, interpersonal synchronization with music might affect social bonding not only via joint action, but also via affective and

neurophysiological mechanisms (e.g., endorphins) associated with the music itself (Tarr et al., 2014). When moving together in time with the same music one shares a common experience. This shared experience might facilitate social bonding compared to the experience of just moving in synchrony without music (Demos et al., 2012). Taken together, these findings suggest that, especially during listening to music, interpersonal synchrony or asynchrony can fulfill or violate hard-wired affective and social expectations.

These socio-emotional characteristics of music can explain why we found an effect of *interpersonal synchrony* on helpfulness during tapping with music but not during tapping with a metronome (Figure 2B). But they also raise the question if the difference in helpfulness represents a more prosocial orientation in the synchrony group resulting from greater social bonding or a less prosocial orientation in the asynchrony group resulting from violated social expectations. The comparison of the number of collected pencils between the four groups, especially the comparison between music and metronome, suggests that asynchronous tapping during listening to music might have negatively affected the social orientation toward the experimenter. In contrast, Hove and Risen (2009) found higher experimenter-likeability ratings after synchronized tapping compared to asynchronous tapping and a control condition in which participants tapped alone, but no difference between asynchronous tapping and the control. How can we explain this divergence?

As already mentioned, our experimental design included two experiences that enable social bonding, namely the synchronization of movements and listening to music (Freeman, 2000; Koelsch, 2010; Tarr et al., 2014). It is possible that, during listening to music, asynchronous tapping resulted in discrepancies between these two experiences, leading to violated affective and social expectations. The lower number of collected pencils after asynchronous tapping with music, as compared to synchronous tapping with music, might show how these discrepancies negatively affected prosocial orientation.

From a methodological point of view, proso-cial effects of synchronization may not be as robust as previous research suggested (Schachner & Garvin, 2010). This might partly be due to the fact that the effect sizes depend on

the measures used. Our study showed that in contrast to the indirect measure of prosocial orientation, the direct measures (i.e., self-reported ratings of experimenter-friendliness and interaction-pleasantness) did not differ between groups.

It is important to note that sympathy-related ratings of the experimenter and helpfulness toward the experimenter represent different partial aspects of social bonding. However, since previous research suggests that interpersonal synchronization affects a wide range of feelings, judgments, and behaviors, including connectedness, likeability, co-operation, helpfulness, and conformity (Demos et al., 2012; Hove & Risen, 2009; Kokal et al., 2011; Wiltermuth & Heath, 2009) these aspects seem to be tightly related. We therefore expected to find comparable results of explicitly assessed experimenter-friendliness and implicitly assessed helpfulness.

The null result of self-reports are due to a ceiling effect. Without this ceiling effect we potentially would have been able to detect differences in ratings of the *sync/music* group and the *async/music* group. Please note that we still found a ceiling effect in self-reports when changing the 9-point Likert scale to a continuous scale from 0 to 100, rephrasing the extreme values of the scales, and training the tapping partner (i.e., the experimenter) to act reserved (Stupacher, Witte, & Wood, unpublished data). A possible explanation for the ceiling effect in self-reports is the individual need for self-consistency (Robins & John, 1997), i.e., high post-tapping ratings could have been driven by high pre-tapping ratings.

In contrast to the implicit assessment of prosocial orientation, self-reports might have been more strongly influenced by social desirability or related motivational distortions. Even though the questionnaires were anonymous, the fact that the experimenter would look at the ratings at some point could have led to more positive ratings than expected. However, the extent to which social desirability can explain differences between explicit and implicit measures is still under debate (Hofmann et al., 2005). Here, we could show that an implicit measure successfully detected changes in prosocial orientation related to interpersonal synchrony, whereas self-reports failed to detect similar effects. We conclude that although, or even because, self-reports suffered from methodological limitations, the use of implicit measures can enrich our understanding of social bonding, interpersonal synchronization, and music.

Acknowledgements

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Paradigms in the compositional practice of Irish singer-songwriters

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Abstract

The singer-songwriter has emerged as a significant figure in contemporary Irish culture. Ireland's *monumental history* in musical practice has cultivated some of the most internationally respected singer-songwriters of recent decades. While much research has been devoted to the songs of Irish artists at large, little attention has been allocated to demystifying their songwriting praxis. The present work critically examines the relationship between the Irish singer-songwriter and wider mediated discourses surrounding their artistry. Independent of genre it interrogates the compositional practices of performing songwriters by way of phenomenological study. Specifically, the *lived experience* of Irish singer-songwriters is explored and evaluated through in-depth interviews, and consideration of artefacts including song texts and recordings. Tracing the most important sources of their creativity it is evident that while some practitioners are largely influenced by indigenous Irish folk music many are predisposed to multicultural traditions. Whilst experiences are unique to individual singer-songwriters many share similar complexities in attempting to migrate from conventional praxis. It is evident that limitations frequently provide artistic definition, thereby safeguarding the practitioner's aesthetic. Accession of an individual *voice* presents an interesting conundrum for a twenty first century singer-songwriter as the emphasis of a traditional culture is by nature, not individually focused. It is concluded that while a grounded musical tradition may certainly be viewed as a privilege, much of the Irish singer-songwriter's labour involves conscious effort in re-encoding their work.

Keywords: singer-songwriter, Irish, practice, phenomenology, culture

Introduction

The practices of Irish singer-songwriters are recurrently subsumed within the larger context of *Irish music* discourse or wide-ranging autobiographical publication. As observed by Negus and Astor (2015) it is important that songwriting practice becomes "more central" to popular music scholarship. While a number of the artists studied herein do not compose or perform what they would term *popular music* most have contributed to popular Irish culture at some level as collaborators or writers for other artists. Specifically, this study locates the *phenomenon* of the Irish performing songwriter in relation to its practitioners *(subjects)* and their artistic creations or songs *(objects)*. In this case, the experiences of nine practitioners were critically evaluated through the course of in-depth interviews and reflection on original compositions. It represents an interdisciplinary study incorporating philosophical, sociological and musicological inquiry. According to Shuker (2001), it is important to consider any aspect of popular culture both as a "social phenomenon" and in terms of its "historical development". As confirmed by the ethnographic studies of Mc Intyre (2011) songs are "generated from antecedent conditions provided by the inherited tradition". Mc Intyre's comprehensive study is however predicated on fieldwork in his native Australia. Naturally, songwriters tailor compositions in accordance with their ongoing musical evolution and abilities, therefore in order to truly interpret their practices it is important to unpack their diverse compositional narratives. This study is therefore inclusive of all Irish singer-songwriters, those closely connected to tradition and those impassioned by diverse aesthetics. As articulated by Irish singer-songwriter Glen Hansard (2003) "just because one singer sells more records than the other, does it really mean their song is any better, everything is valid or nothing is valid".

Methods

As a methodological inquiry phenomenology measures human experience in terms of the natural occurrence of events. Founder of modern phenomenological practice Husserl expressed this broadly as *back to the things themselves*, arguing that it is only through reflection of an entire experience that one can truly evaluate its *essence*. In the present context it is used to understand how song composition is perceived relative to the *consciousness* (Husserl, 1927) and *subjective* experience of its composers. Reflecting on lived experiences in such a way reveals underlying structures and hence *paradigms* (Kuhn, 1962) in relation to multiple participants. An interpretivist approach is adopted, facilitating "a Gadamerian dialogue" between "pre-understandings", and "newly emerging understandings of the participant's world" (Smith et al. 2009).

Firstly, the author (researcher) wishes to make his own position transparent as a practicing Irish singer-songwriter. Consequently, the Husserlian approach of phenomenological reduction, *epoché* or *bracketing*, which advocates suspension of the researcher's subjectivity is considered impracticable. The singer-songwriter (author and participants) represents a "double edged phenomenon" (Giddens, 1990) as both "writer (s) of songs" and "performer (s) of those same songs". Being a practicing singer-songwriter facilitates a certain rapport between the researcher (author) and participants thereby safeguarding interpretation of particularities unique to the genre. Such approaches according to Taylor (2011) afford "deeper levels of understanding" being "at the centre of the cultural phenomenon".

Firstly, participants were recruited with experience in the phenomenon of interest and in-depth interviews were conducted to the point of *saturation*. In order to reflect diverse perspectives, *maximum variation sampling* (Creswell, 2013) was chosen as the key selection strategy. Snowball sampling was also employed whereby participants suggested the value of contributions from other "information rich sources". Interviews were conducted over a twelve-month period ending in April 2016. Of the nine artists studied one third reported strong links with traditional Irish music or folk song, a third had some degree of exposure in their formative years and remaining practitioners claimed that it had little or no influence on their aesthetic. Duration of interviews varied from two to three hours each, depending on participant availability. Interviews were semi-structured, featuring open-ended questions such as: "How would you describe your experience with songwriting"? Interviews were recorded to a portable audio device and later transcribed for analysis. The author (researcher) was mostly engaged in listening and observing, anticipating supplementary questions within the *natural flow* of conversation. At interview stage participants were detached from their Husserlian *natural attitude* and in a mode of reflection on the *essence* of their experience.

To facilitate participant involvement, the study was briefly contextualised in advance of each interview. Where possible artists were visited within their natural environment. In the majority of cases interviews were conducted face-to-face in accordance with live performance dates, mostly in hotel lobbies or cafés. In a limited number of cases, interviews were conducted via videoconferencing to accommodate tour schedules. Both content and discourse analyses were employed to extract meaning from the data, hence in addition to what participants said, the manner in which they responded were appraised. This involved chronicling of non-verbal communication such as *tone of voice* and *gestures*. Transcription of data was carried out within as short a timeframe as possible after each interview. Following transcription, recordings were reviewed contemporaneously as audio and text and memos were recorded next to the data periodically. In preference to beginning with a hypothesis, an inductive approach was adopted thereby allowing themes to emerge directly from the data. As phenomenology is largely descriptive, direct quotations from participants were key to interpretation. Horizontalization (Moustakas, 1994) was employed to extract "significant statements" from the data, illustrative of the songwriting experience for each participant. These were subsequently assembled into themes (open coded) to deduce how participants experienced the phenomenon. Computer application NVivo 11 was utilised to assist data analysis. Following several stages of constant comparison across all practitioners, principle themes were documented. Finally, through a hermeneutic lens the *essence* was

explicated, giving *others* a perspective on the phenomenon of the Irish singer-songwriter.

Results

As anticipated many universal song themes emerged. While largely personal, narrative, romantic or political in nature, some songs focussed on "historic events", "individuals" or "emigration". The significance of personal memory was accentuated in many cases with one practitioner summarising their role as a carrier of "old news" contemporarily overlooked. While a third of participants featured compositions in both Irish Gaelic and English, one artist studied sang predominantly in *Sean Nós* (old way). Of those proficient in both languages some occasionally sang *macaronic songs* (songs containing both Irish and English text).

An overarching theme of artistic *labour* was evident in the early stages of investigation where *in vivo coding* (Glaser and Strauss, 1967) established "work" as the most frequently used term by participants. Six principle themes emerged from the data and may be summarised as:

- Temporal Concerns
- Consciousness
- Artistic Discipline
- Writing Environment
- Artistic Challenges
- Musical Traditions

Temporal Concerns

Firstly, the impetus to write songs was dependent on individual biographies. For those with a large repertoire of traditional material, motives were unequivocally "to have something new to sing". These songs were principally narrative based and rich in imagery. As expected, total time dedicated to composing a new song varied across participants from *short burst* writing sessions to lengthy and elaborate reiterative processes. Works described by artists as "legacy songs" often required numerous revisions and in two cases successive collaboration with co-writers to realise their definitive structure. Further participants reputed spending extended periods re-writing the same song, up to ten-years in one case. Conversely, three artists described how their "most popular" or commercially successful songs were those written inadvertently and within less than an hour.

Consciousness

One artist explicated how several songs were written and discarded in advance of their most successful song, implicitly laying the groundwork for a *hit* recording. The same song was described by the participant as ceaselessly "going on in the subconscious", finally taking "half an hour" to complete. Another artist recounted how what they perceived as "one of their best songs" was "written in three minutes" while performing other routine duties. The experience was affectionately described as if "someone had sent it to them in the post, or e-mailed it to their head". The sense of bewilderment yet accomplishment was evident in the faces of both artists.

Artistic Discipline

While the majority of participants approached songwriting in an unstructured fashion they reported distinct separation between the stimulation and actively creative stages. One artist articulated the process as "two-tier", at first an inspirational phase, "removed from the world" followed by a focused restructuring phase where "songcrafting" materialised. In many cases a final review stage was employed to validate the song not only to oneself but also to "trusted" *others*. One advocate of artistic structure vowed how they "wouldn't work away from the desk". Proximity to recording devices was endorsed in multiple instances with some losing potential songs "simply by failing to get to the recorder on time". This was characteristic of self-taught practitioners or those from an inherited musical tradition.

Writing Environment

Physical locations were deemed influential to songwriting practice. One artist remarked how the "cluttered lives" of modernity prompted "a conscious effort" to delineate songwriting *time and space*. Another described their songwriting space as one for "imagining, dreaming, and gestating". Interestingly, many advocated the abolition of disruptive media such as *radio*. Concepts of the *ideal space*

varied however as driving a car, particularly "long distance driving" was viewed as most productive in generating song ideas in three instances. Five practitioners recounted having major compositions completed or partially completed in locations including France, Germany, Australia and USA with two artists reporting the success of collaborative efforts in Nashville, Tennessee.

Artistic Challenges

The songwriting process was portrayed as arduous by a number of practitioners. One illuminated their hesitation to engage as "frequently making excuses not to write". Certain findings proved surprising with songwriters openly admitting "I hate writing songs, "I don't know anybody who loves it, it's painful". Although communicated with a smile, in this case it was evident that performing was preferred to writing. Of the artists who played an instrument, most were guitarists or pianists acknowledging that improvisation was often the starting point of a song. Two such artists remarked on the challenges in merging lyrical and melodic concepts that were composed separately. One artist commented that what they were trying to achieve musically was "quite possibly unattainable", a sentiment intensified by a *furrowing of the brow*.

Musical Traditions

Fusing lyric and melody was largely dependent on cultural backgrounds of individuals and stylistic practices. One traditionally grounded songwriter explained how songs might begin as prose or a poem which would potentially "become a song". In several instances it was remarked how both the melody and lyric were synchronous or how the "the tune presented itself during the writing". Reverence for the "dronal aspect" of music was highlighted in two cases. Interestingly, this was expressed independently by an artist closely associated with the tradition and one without any affiliation whatsoever. Many artists including those with strong traditional associations admitted to becoming musically hybridised as young adolescents, promoting more expansive musical aesthetics in adulthood. Genres underpinning the practices of artists studied were wide and varied comprising "Sean Nós", "Irish folk music",

"storytelling country", "blues", "rock" "popular music", performance based "art music" and various hybrids.

Discussion

At the heart of the current investigation is the independently produced song. Very often songs are judged simply by how they stand the test of time. While songs may be appraised for their lyrical richness, originality, melodies, harmonic structures or counterpoint, similar to other creative art forms what constitutes an exceptional song remains subjective. Since the turn of the twenty first century Ireland has witnessed a proliferation of acoustic performance spaces in the form of *songwriter sessions*, *folk clubs* and *open mics*. In addition to performing songs there is a growing tendency to contextualise the songwriting process for such audiences. While artists will often deconstruct a specific song they rarely examine the intricacies of *on the ground* practices.

Reviewing the *lived experiences* of Irish singer-songwriters it is evident that some artists are borrowing from traditional sources more explicitly than others. Indisputably, they draw inspiration from pan-temporal and multicultural sources supporting the hypothesis that "the dialectic of international/national haunts *Irish popular music*" (Smyth, 2005). Essentially, Irish artists demonstrate that the singer-songwriter engages in multiple representations of *self*. While it is evident that that the singer-songwriter's work often concerns itself with autobiographical investigation (Brackett 2008), many artists reviewed use it more as an extension of their socio-cultural heritage. Interest in musical drones is particularly inspiring as it appears to bridge the gap between *traditional* and experimental *art music*. This is due to its prominence in both ancient and avant-garde forms as well as indigenous Irish music.

Evidently, songwriters immersed in traditional practice from an early age felt some responsibility to honour such a privilege. Memories continue to pervade the themes of Irish song texts suggesting a longing not only to revisit the past but also to re-examine its relevance in contemporary society. Practitioners confirm the premise that memory is central to the actualisation of songs. One participant at some level demonstrated

continuation the *bardic tradition*. Findings indicate that the *oral tradition* prevails with many relying on recording devices to capture what Rubin (1995) terms the "evanescent property of sound". In fact, results concur with Rubin's comprehensive study of the oral tradition citing "meaning, imagery and sound" as its key "constraints".

The songwriting processes investigated recall Wolterstoff's (1987/2010) three stage representation of a creative work, namely, "inspiration", "selection" and "evaluation". The process outlines a "pre-conscious" stage (inspiration) followed by a "conscious" (selective) stage, culminating in a what Wolterstoff terms a "measure up to standards" or "evaluation". This study depicts the Irish songwriter as a practitioner highly conscious of artistic causality, ultimately aware that a mere fraction of their *labour* results in a completed artefact. They are nonetheless rewarded when the cumulative efforts of their practice collide, albeit unexpectedly in many cases. Underpinned by a central theme of "work", all participants studied exemplify the conceptualisation of a *muse* as "that for whom you long to labour" (Tharp, 2008).

It is apparent from the results that safeguarding a working environment was considered significant in all cases. Bargh and Morsella (2008) hypothesise that activities aforementioned such as driving a car although "intentional" are one of the "efficient procedures that can run off outside of consciousness". Evidently, focussing on a routine act appears to promote aggregation of otherwise detached *song fragments* counteracting the "lack of concentration" substantiated by "diffused thinking" (Csikszentmihalyi, 1996).

As expected, there are many aspects of songwriting practice which are not unique to Irish artists. Evidently, at the heart of the Irish singer-songwriter lies human characteristics including self-belief, self-motivation and resilience. It is equally apparent that songwriting often involves continuous re-evaluation in the search for utopian ideals.

The *essence* of the Irish singer-songwriter as composer may be summarised as a diligent practitioner, cognizant of their musical and socio-cultural history. Although writing unsystematically they largely embody continuity of the oral tradition or "uninterrupted chain of transmission" (UNESCO, 2006).

Although writing mostly in isolation the Irish artist is amenable to collaboration both nationally and internationally. The reality in which a song unfolds is perplexing and fascinating for practitioners in equal measure. Why popular songs tend to *quickly write themselves* is unresolved, nonetheless conceivably related to a series of tentative efforts beforehand. Evidently, those from a traditional Irish musical background or *Gaeltacht* region (primarily Irish Gaelic speaking) have an affirmed sense of *Irishness* which translates in their approach to songwriting and song interpretation. Hence, language and domestic themes remain distinguishing features of *Irish* singer-songwriter identity. Many artists, with the possible exception of those singing in regional dialects assume a universal western singer-songwriter aesthetic. Although artistic limitations go some way towards individualising an Irish singer-songwriter, conscious effort is required in re-encoding their work for contemporary audiences.

Suggestions for further work include examination of the songwriting process for specific songs and their performance aesthetics at close range. It is expected that melodic and rhythmic structural investigations would further illuminate the practices of Irish singer-songwriters thereby offering wide-ranging interpretation of the present study.

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"Music in Mental Hospital" - Historical Perspectives on the Use of Music and Music Therapy in Finnish Psychiatric Hospitals

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Abstract

There have been musical activities in Finnish psychiatric hospitals since early on. Modern music therapy, on the other hand, began much later. Both of these traditions are now fading, due to closure of psychiatric hospitals and reshaping of psychiatry. The past experience could still be utilized as part of the existing system, so that adult patients could benefit from the proven powers of music in the future as well. The aim of this paper was to discover the uses and meanings of music and music therapy in Finnish psychiatric hospitals between 1841-2015, as a part of a Ph. D study on music therapy. The doctoral dissertation studies psychiatric music therapy of working-age adult patients, and how it has changed from historical and contemporary perspectives. The research material consisted of hospital histories (texts and photographs), annual hospital reports, and professional literature on music therapy. The research method was qualitative content analysis. To interpret and analyze the results, the hermeneutic circle was used. In addition, the authors of aforementioned literature on music therapy were interviewed by phone, and asked to evaluate the created concepts and their definitions. As a result of the study, the uses and meanings of music therapy could be detailed using descriptive classification. The results suggest that music has been utilized in hospitals in multiple ways; connecting to hospital culture, treatment and rehabilitation, and religion. From its early design, the purpose of music therapy has become more specific. Later forms of music therapy have acted as part of general hospital services; a service by the therapist rather than a communal activity. Further research is required on the evolution of psychiatric services and to better describe the change process.

Keywords: music therapy, psychiatry, history, qualitative content analysis, music in hospitals

Introduction

Musical activity is known to have existed in hospitals since their early days, but the data are scattered. Music therapy started in Finland as early as the 1960's, but modern Finnish music therapy was not organized until 1973. After this, music therapy began spread to several psychiatric hospitals, gradually becoming regular. (Kylmä, 1986; Lehtonen, Salo, Wirzenius, 1991.) Psychiatric services have undergone profound changes over the last few decades. Hospitals have been downsized or closed, and the treatment of patients has been handed from institutions to the community and general hospitals. There is some literature on the use of music in hospitals and its meanings and purposes, but the data are scattered. In addition, there is almost no research on adult music therapy in Finnish hospitals. The aim of this paper was to discover the uses and meanings of music and music therapy in Finnish psychiatric hospitals between 1841-2015.

Psychiatric music therapy, and its uses and meanings, were first defined in Finland by Lehikoinen (1973). At that time music therapy was divided into two main forms, active and passive. The latter could mean, for example, listening to music instead of producing it actively. Music therapy treatment and rehabilitation became known as clinical music therapy, while pedagogical music therapy focused on other areas. These definitions were also influenced by Nordic cooperation in the field of music therapy. It was not until the 1980's that the first doctoral thesis on music therapy was published, and the Music Therapy magazine began publication in 1983. In earlier literature, the frame of reference on music therapy could be described as humanistic and behavioral; in the 80's it became more psychoanalytic. In the 1990's there were more and more influences from international development of psychiatric music therapy. The number of different frameworks increased, and clinical improvisation and the GIM method gained a foothold. Both of them are today well-

established methods in the field of music therapy. Clinical improvisation is a special form of musical interaction, while the GIM method focuses on musical imagery. Starting from the 2000's, many international theories and studies have increased their significance as background theories of Finnish music therapy. Finnish research has focused, for example, on the initial assessment of psychiatric patients, physioacoustic therapy, and music therapy for depressive patients in outpatient care. (Lehikoinen 1973; Lehtonen 1986; Ahonen 1993; Erkkilä 2007.)

Today, music therapy is still practiced in a few psychiatric hospitals. There is no record of remaining hospital services or possibilities in outpatient settings, and further research is needed. The Social Insurance Institution of Finland (KELA) supports music therapy for young adults only, and there is also a possibility to receive music therapy as medical rehabilitation. However, there is positive research evidence on psychiatric music therapy for adults as well. Many hospitals no longer offer music therapy, and therefore there is a need to provide treatment and rehabilitation options in outpatient care as well. Results of this study may be useful for future development and discussions, so that music and music therapy could continue to be a part of adult treatment and rehabilitation.

Historical study of psychiatry is naturally often focused on the medical point of view. Finnish literature is no exception in that music or music therapy is barely mentioned in regards to medicine or psychiatry. Historical research is sometimes guilty of elitist and ethnocentric views, and history is often written too tendentiously. Modern music therapy needs a history, and medical history needs to include music therapy in its master narrative of the past. The theories are not naturally born by evolution, but the result of continuous practice. It is not only a question of including music therapy in the history of medicine, but the research will be provide important information on music therapy itself – its background can be better understood, and the base knowledge enriched and supplemented. However, the results must be related to the current practice in order to achieve benefits. (Horden, 2001; Gouk, 2000; Solomon & Heller, 1982; Solomon, 2005.)

Data and Methods

The data consists of hospital histories; supplemented by hospitals' annual reports and professional literature on music therapy. 1) 22 hospital history books were collected from libraries and archives between 2014-2015. Annual reports were collected selectively for information to complement the histories, as well as information on hospitals without a written history. The data analysis was carried out simultaneously with the data collection, which was stopped when the purposes of the analysis were satisfied, and new categories could no longer be found. The data collection also took into account the territorial coverage of different parts of Finland, as well as the publications covering varying decades of hospital history. The material in question was published between 1937-2013. The hospital histories and annual reports contained information on music and music therapy from 20 different hospitals. 2) Professional texts on music therapy were collected from the Finnish 'Musiikkiterapia' magazine and professional literature in the field. In the selection of these texts, the following criteria were used: the selected texts had to at least partially concern music therapy for adult psychiatric patients, carried out by a Finnish music therapist in a psychiatric hospital. Theoretical articles, interviews and memoirs were excluded. The data that met this criteria included 9 texts: 4 magazine articles, 3 chapters from professional books, and 2 Master's theses. The selected material was published between 1983-2012.

The research method used was qualitative content analysis. The analysis unit was one paragraph of a larger text; the smallest being only one sentence (see Table 1). The analysis units were collected from texts based on reference to music therapy or music. The sentences were abbreviated, grouped and coded with the computer software ATLAS.ti. The texts were organized, abbreviated and

Table 1. An Example of Data Analysis

Example Segment from Text (source: annual report 1932, written by senior physician)	Reduced Data
"The hospital has acquired radio receiving equipment, so that patients are able to listen to church services in their day rooms, and the staff in the common rooms. The radio has been acquired specifically to the delight and benefit of the patients, as peaceful music and other suitable entertainment have been found to have a positive effect on the restless mind of an ill person."	Radio acquisition. Religious access. Patients' and staff's pleasure and benefit. Music for amusement. Soothing music has positive effects on the ill restless mind. Peaceful music appropriate. 1930. Perception by chief physician.
Summarizing Radio Uses	**Summary of Meanings**
- Radio equipment was also used to transmit gramophone music - Radios were purchased for pleasure and benefit - Church services were listened to and radio acted as accompaniment for church hymns - Music was listened to in day rooms, banquet hall, patient library and dorm rooms - National festivals were listened to - At first radio was only listened to on weekends or Sundays, entertainment programs were sometimes broadcast too late in the evening - In the 60's radio and television programs were not censored from the patients - People danced spontaneously to the beat of the radio or decided to organize dances (also with gramophone + radio equipment)	- Positive mood effects: fun, refreshing - Health-promoting effects: soothing, calming - Connection to spirituality and religious services - Entertainment - Patients' and staff's pleasure and benefit - Increasing patient comfort

→ Category Formation (main category): Radio Music

summarized based on similarities and differences in the data. The main categories were created by following the research questions. Similarities and differences in the categories and the subcategories were identified and written down. Photographs from history books, historical articles and professional articles were also analyzed. As the material needed to be homogenous, different types of texts and photographs were not mixed with each other. Photographs (38 pcs) were coded and analyzed separately from the text material. Historical texts and professional texts were also separated. Only after the coding was finished were the different types of material integrated into the overall interpretation. The categorization of the data involved some quantitative elements, as the distribution among different classes in the material was counted. However, the content analysis was still entirely descriptive. Historical truth was not the main objective, as the truth is more closely linked to the context from which the results are derived. Combination of qualitative content analysis and hermeneutics can be problematic. For this reason, a descriptive analysis was carried out first, and followed by a hermeneutic interpretation. (Tuomi & Sarajärvi, 2003; Schreier, 2013; Bauer & Aarts, 2000.)

The coding frame was restored to its original context, and through interpretation (see example later in the text), considered in relation to the original time period, as well as the

historical continuum. The hermeneutic analysis of the historical perspective aims to provide new viewpoints, where the past meets the researcher's fresh ideas. The historical texts should first be approached as such; as complete texts to be accepted as truths; then interpreted from historical and psychological perspectives. (Gadamer, 2013.)

Interpretation by using the hermeneutic circle: In the early days, before the radio, gramophone played music for the patients. Radios first came to hospitals at the turn from

hardly had any stimulus in their leisure time during the first few decades. During the day they were working outside, or at the workshops. Men and women were separated. The radio made it possible to listen to music, but it was likely only available to some patients, and perhaps only once a week. Spirituality was also connected to the radio. In the beginning, the staff lived at the hospitals, and the acquisition of the radio had an effect on their free time as well. Banquet halls were being constructed at the time the radio was invented, and radio equipment also served at staff get-togethers.

Table 2. Uses of Music Therapy and Meanings Given to Them

Uses of Music: 11 Categories	Meanings of Music: 7 Categories
Radio Music (11 hospitals) Ceremonial Music (11 hospitals) Concerts and Musical Guests (11 hospitals) Choirs and Small Orchestras (10 hospitals) Annual Festival Music (9 hospitals) Dances (9 hospitals) Excursions and Special Occasions (8 hospitals) Soirees (6 hospitals) Recorded Concerts and Music Listening Groups (6 hospitals) Other Musical Groups (4 hospitals)	Soothing Activating Spiritual Rehabilitative Nurturing Part of Community and Tradition Entertainment and Hobby

A) Data: Hospital Histories and Annual Reports
1. Early forms of music therapy
- Uses: broad definition of music therapy, all musical activities with patients
- Meaning: group principle, possibility to musical activity for all, effect on mood, inclusion, influence
2. More structured forms of music therapy
- Uses: may contain elements from broad definition, but practitioner has training for music therapy, implementation more specific
- Meanings: rehabilitation, focus on handling psychic problems or alleviation of symptoms, effects on mood, healing effects, expression of emotion, multiple methods
B) Data: Professional literature on music therapy
Uses:
1. Assessment
2. Group Therapy
3. Individual Therapy
4. (Training and Supervision)
5. Varying Levels of Implementation
Meanings:
- Cooperation with different parties creates preconditions to functionality and achievement
- Needs of the patient observed from different viewpoints
- Music connects on many levels to patient's life and experiences
- In music therapy, conditions for contact and interaction are actively created
- Emotions, abilities and capability are reflected and examined
- Music therapy complements overall care

the 1920's to the 30's. To afford this purchase, jumble sales were held. Radios were first acquired for peaceful departments only; and to all departments after World War II. Patients

These developed into events known as 'iltamat' ('soiree'), which could also be attended by peaceful patients. Among the data there were clear pictures of radios (tube radios) in the day

room and in the patient library from the 1950's. The TV came to the day rooms at the end of the 50's, but the radio still remained. Radio music has been given positive meanings, and also therapeutic ones. Before the introduction of drug treatment, hospitals were very restless, even noisy. The soothing meaning that music was given was befitting for the time, when treatment mostly involved soothing baths (hydrotherapy) and working. The overall impression is humanistic. Radio music is shared by all, and as such a part of normal life, in the same way as work, religion, and annual festive activities.

Results

Table 2 describes different uses of music and music therapy, and the meanings they were given. Ceremonial music consists of music played at the hospital inauguration, church service music and funeral music. Concerts and musical guests came from outside the hospital. Musical guests were usually brass bands, choirs and guest artists; sometimes also the city symphony orchestra. Choral and orchestral activity covers activities such as choirs and orchestras among the staff and the patients. Dances were greatly in-demand by the patients; and in recent decades, this activity has been held on a weekly basis. Excursions included trips to concerts and musicals, but also the hospital's own summer trips, with music, singing and dancing. Soirees were also often held in the departments, attended by its own and visiting patients, as well as the staff. Later, the patients' relatives could also attend. Interaction among patients, staff and relatives was seen as natural in this atmosphere. Music listening groups were popular; later the hospital staff also included elements of music therapy. Other groups involving music were music gymnastics group, as well as rehabilitative groups. The earliest single mention of music was from the year 1916; regarding concerts arranged for the patients. The latest reference to music was from 2005, mentioning the establishment of the hospital choir. Most photographs were taken at the dances – 15/38 pcs. The second most common photograph subject was an individual player or the orchestra. In the bottommost part of Table 2, music therapy uses and their meanings are categorized. Results have been divided into 2 groups on the basis of data type: A) Historical data and B) Professional

literature. Early forms of music therapy, identified from the historical data (A), represent a very broad definition of music therapy. Thus defined, all work involving musical activities with patients might have been called music therapy. When

defined as the more structured forms of music therapy, the therapy might still contain elements from the previous. What makes the latter different, however, is the more specific implementation, and actual training in the field. The music therapy data contained only 1 photograph. In professional literature, music therapy uses were initially divided into 4 categories. After the interviews with the authors, a fifth category was added (4. Training and supervision). The implementation levels of music therapy could not be determined due to their high variety. In articles, the background theory and the references to music therapy were mainly psychoanalytic. Categories of music therapy use were as follows: Assessment, Individual Therapy, Group Therapy, Training and Supervision Services and Varying Levels of Implementation. 2 Master's theses focused on initial assessment; 4 articles focused on group therapy, and 3 on both individual and group therapy.

Discussion

The merits of this research lay in the descriptive analysis, as well as a new viewpoint for the topic. However, the historical truth is found in the original context only. The music culture in hospitals surprised the researcher by its versatility. The meanings given to music were difficult to identify at times, and the data was scarce. On the other hand, the meanings were what linked the phenomena to their time period and context. The uses of music were connected to the community and the culture, but it could also have other meanings in patient treatment. In the early days, patients tended to be restless; later too passive. Even modern music therapy is divided into soothing and activating types of methods. Estimates of the existence of early music therapy have to be viewed critically as well, as it is possible that past musical activities have only been called music therapy afterwards. The more structured forms of music therapy have been more goal-

oriented and focused on the patient's needs. It is perhaps clear that the photographs and reports from the hospitals provide the ideal image. However, the recounts are linked to a humanism toward patients, which is often overlooked when describing early psychiatric treatments. This is noteworthy in the discussion of mental illness stigma. In professional literature on music therapy, the key elements were linked to cooperation and music therapy complementing the overall care; attention to the needs of the patient, and reflection emotions, abilities and capability. I interviewed four article authors, and three of them agreed that the concepts reflected the content of their articles very well. All of them thought that the concepts successfully described the practical work performed at the time they wrote the text. Although there was a great deal of variation among the texts, they also had plenty in common, and the meanings described had the same general focus. However, there were too few articles to make broad generalizations. Of the hospitals found in the data, 10 of 20 have been closed, 1 of them lost in the war to Russia. In addition, the Tammiharju hospital has ended most of its services; and, most recently, a decision has been made to close the Kellokoski hospital as well. There are still 8 functional hospitals of 20, some of which have their functions centralized to central hospitals. The most radical reformists have even condemned the patient dances for having institutionalizing effects. However, the economic recession of the 1990's served to show the difficulties in the organization of outpatient services. Although the patient may be able to choose where to seek help in the future, it does not entail that everyone will have the sufficient resources or motivation to seek it. If the patient should choose to drink beer alone at home, it might be a good idea to consider alternative, motivating treatment and rehabilitation methods for them. This sub-study will render the change process even more interesting. From the very beginning, hospital treatment has been developed to be more humanistic, and when this actually began, hospitals were closed. Hospitals were condemned for being more or less useless or even harmful for the patients. Creativity, however, still remains a human right. A more extensive version of this article on this study is under review in *Musiikki* journal.

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Isomorphism of Pitch and Time

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Abstract

An ongoing debate regarding the perception of pitch and time is whether information on the two dimensions is processed independently or interactively. To study this, we tested whether listeners prefer sequences in which tonally stable tones coincide with rhythmically stable tones. Our study builds on a noted isomorphism between pitch intervals in the diatonic scale and tone durations in the standard rhythm originating in Ghana. This isomorphism is shown in a) the maximally even structure of 2212221 and b) the cyclic nature with seven possible starting points. To better understand pitch-time relationship, we conducted two experiments. In Experiment 1, we created seven scales based on the diatonic pattern and seven rhythms based on the standard pattern by shifting the starting pitch interval or tone duration. To measure the perceived tonal stability of tones in the scales, in Experiment 1a each scale was followed by a probe tone and listeners judged how well the tone fit into the scale. To measure the perceived rhythmic stability of tones in the rhythms, in Experiment 1b each position of the sequences was accented dynamically and listeners judged how well the accent fit into the rhythm. These ratings were then used in analyzing the results of Experiment 2 that used all 49 pairs combining the 7 scales and 7 rhythms in Experiment 1. Participants rated a) how well the rhythm fits the scale for each pair and b) familiarity and well-formedness of each scale and rhythm. Results show that probe ratings from Experiment 1 predict judgments in Experiment 2. Specifically, scale/rhythm pairs received higher ratings when tonal and rhythmic hierarchies correlated more strongly with each other. In addition, we found a familiarity bias toward the major scale. After accounting for this bias, results remain significant, suggesting that information from the two individual dimensions interact perceptually.

Keywords: pitch-time relationship, diatonic scale, standard pattern, tone duration, probe tone

Introduction

Pressing (1983) noted the isomorphism shown in Figure 1a between the pitch intervals in the diatonic scale in Western music and the durations in what is called the standard pattern. Whereas the diatonic scale is the most prominent scale in Western tonal music, the standard pattern is the most used African rhythmic pattern, originating in Ewe dance music in Ghana (Agawu, 2006). It can be found running in the background of Afro-Latin music, such as Salsa. The Standard Pattern is often played in a repeated fashion, meaning that, once the rhythm ends, it loops back to the beginning. This repetition can also be found in the domain of scales; it takes the form that the scale intervals repeat when the octave is reached. In fact, this cyclic feature is only one of the parallels between the diatonic scale and the standard pattern. As Figure 1b shows, this shared structure between scale and rhythm can be explained as a maximally even set (Clough & Douthett, 1991), where the seven white

circles are maximally evenly spread among the twelve evenly distributed positions around a circle. On the circle, the distance between every two adjacent positions on the circle can represent a semitone in pitch or an eighth note in duration. Starting from the white circle at the 12 o'clock position and counting clockwise, the distance between every two adjacent white circles can be expressed as 2212221, which can be called the diatonic pattern. This structure describes the pitch intervals between every two consecutive tones in the diatonic scale, and it also describes the temporal intervals between every two consecutive temporal positions in the standard pattern.

The diatonic pattern has two important features. One is that it is asymmetrical (Browne, 1981; Rahn, 1996). Each of the tones bears a unique constellation of relations to every other tone. So even if listeners only hear two or three of them, they can still tell where in this pattern they are, and where the most stable tone or the most stressed tone is. As

briefly touched on earlier, the other feature is that the diatonic pattern is cyclic (Iyer, Bilmes, Wright, & Wessel, 1997; Temperley, 2000). This allows a scale or a rhythm to start from any of these seven points and then cycle back to the starting point, which generates seven unique patterns. This theoretically prominent isomorphism between the diatonic scale and the standard pattern suggests a new approach to studying how pitch and time combine perceptually.

In the ongoing debate regarding how information about pitch and time combine, a number of studies have provided evidence for two opposing positions (as summarized in Krumhansl, 2000; see also Prince & Schmuckler, 2014). One is that pitch and time are two separable dimensions, where one dimension does not interact with the perception of the other. In support of this, the perception of melodic similarity has been found to be an additive function of the similarity of the melodic patterns and the similarity of the rhythmic patterns (Monahan & Carterette, 1985). A similar result was found in a study finding that judgments of phrase endings were an additive function of tonal and metrical hierarchies (Palmer & Krumhansl, 1987a&b). Another source of support for the independence position comes from the neuropsychological literature in which patients may loose sensitivity to melodic information while retaining the ability to distinguish between rhythms (e.g., Peretz & Kolinsky, 1993).

The other position is that pitch and time interact perceptually. This means that change in one dimension affects the perception of the other. A corpus study showed that tonally stable pitch classes tend to occur at temporally stable positions (Prince & Schmuckler, 2014). Other studies found a pitch bias where tonal stability affects judgments of temporal positions (Prince, Thompson, & Schmuckler, 2009) and meter perception (Ellis & Jones, 2009). In the opposite direction, studies have found better memory for tones occurring at rhythmically expected points in time (Jones, Moynihan, MacKenzie, & Puente, 2002). Overall, the precise nature of the pitch-time relationship is not yet well understood.

Inspired by the isomorphism between the diatonic scale and the standard pattern, the current experiments took an alternative approach to the question of how pitch and time are processed. The experiments asked whether judgments of how well a rhythm fit a scale could be accounted for by how much the tonally stable tones and the rhythmically stable tones coincided. That is, were the fit judgments higher when the two hierarchies of stability correlated with one another?

Experiment 1

The purpose of this experiment was to measure tonal and rhythmic stability in the seven scales and seven rhythms that are formed by shifting the starting pitch interval or tone duration in Figure 1b. In order to measure the perceived tonal stability of the tones in the scales, Experiment 1a was a probe tone experiment in which each of the probe tones following the scales was judged as to how well it fit with the scale context. In order to measure the perceived rhythmic stability of each of the tones in the rhythms, in Experiment 1b each position of the sequences was accented dynamically and listeners judged how well the accent fit with the rhythm. These judgments were then used in the analysis of the results of Experiment 2 that used all 49 possible combinations of the 7 scales and 7 rhythms in Experiment 1.

Method

Participants

Forty-five Cornell University students participated in each experiment for course credit or a $5 cash reward. Thirty-one participated in both. In both studies, all but 1 were musically trained. Participants in experiment 1a had an average of 14 years of musical training; 3 had absolute pitch. Participants in experiment 1b had an average of 12.8 years of musical training.

Stimulus materials

In both experiments, all sequences consisted of 8 tones, forming 7 intervals. They were created using GarageBand and were sounded in piano timbre. In Experiment 1a, the seven scales were constructed by shifting the starting interval on the diatonic pattern in Figure 1b. For example, Scale1 had the intervals (in semitones) 2212221, Scale2 had the intervals 2122212, and so on. Each scale was constructed in both ascending and descending forms, beginning and ending on C. The range of the ascending sequence was C2

to C3, and the range of the descending sequence was C4 to C5 (details see Krumhansl & Shepard, 1979). The seven scales were followed by a probe tone that was one of the seven tones in the scale, which was played in the range of C3 to C4 between the ranges of the two scale contexts. A baseline trial was also composed for each scale with isochronous rhythm. For Experiment 1b, we constructed seven rhythms by shifting the starting duration on the standard pattern in Figure 1b. For example, Rhythm1 had the durations (in eighth notes) 2212221, Rhythm2 had the durations 2122212, and so on. They were played monotonically on C3. On successive trials, each of the seven temporal positions was dynamically accented; this is called the probe accent. A baseline trial was also composed for each rhythm with monotonic pitch. All rhythms were played twice with a short pause in between.

Procedure

Participants were asked to listen to one stimulus at a time and then make their rating. In Experiment 1a, they rated how well the probe tone fits into the scale by moving a slider on a continuous scale from extremely bad fit to extremely good fit. In Experiment 1b, they rated how well the probe accent fits into the rhythm by moving the same slider. In both studies, they first completed four practice trials. The trials were blocked by scale or rhythm. Each block began with the relevant scale or rhythm played in a neutral form, that is, without a probe tone or accent. The neutral form for Experiment 1a was an ascending scale followed by the same scale in descending order, with a short pause in between; the neutral trial for Experiment 1b was a rhythm played twice with a short pause in between. After the neutral trial, they listened to and rated the probes for that particular scale or rhythm, and then moved on to a different scale or rhythm which were presented in a randomized order. Once they rated all probe trials for the seven scales or rhythms, they listened to and rated each of the 7 baseline trials in a randomized order on two scales: how familiar the scale or rhythm is, and how well-formed the scale or rhythm seems (in other words, whether the scale or rhythm forms a good pattern). Both items were also rated by moving a slider on a continuous scale, from extremely unfamiliar or ill-formed to extremely familiar or well-formed. At the end

of the study, they filled out a demographics questionnaire. Each study lasted approximately 30 minutes.

Experiment 2

Method

Participants

Fifty Cornell University students participated in the experiment for course credit. All but 4 were musically trained. Participants had an average of 11.3 years of musical training; 3 had absolute pitch.

Stimulus materials

Forty-nine scale/rhythm pairs were constructed by combining the seven scales and the seven rhythms used in Experiment 1. As Table 1 shows, out of all 49 stimuli, the seven on the diagonal in this table are matched pairs, because both the scale and the rhythm start from the same point in the diatonic pattern in Figure 1b. This means that the scale and the rhythm share the same structure. The rest are mismatched pairs, because the scale and the rhythm do not share the same structure. In addition, the same fourteen baseline trials from Experiment 1 were used again as baseline trials.

Procedure

Participants were asked to listen to one stimulus at a time. After each listening, they rated how well the rhythm fits the scale by moving a slider on a continuous scale from extremely bad fit to extremely good fit. First, they completed four practice trials, and then rated the 49 pairs in a randomized order. After filling out a demographics questionnaire, they listened to and rated the 49 pairs for a second time, in a different randomized order. After filling out another demographics questionnaire, they listened to and rated familiarity and well-formedness for each of the 14 baseline trials, presented in a randomized order. The study lasted approximately 30 minutes.

Results

Data were processed in the following way. All continuous rating scales were coded from -100 to 100, with -100 being extremely bad fit, unfamiliar, or ill-formed, and 100 being extremely good fit, familiar, or well-formed. For Experiment 1a, probe tone ratings from ascending and descending trials were averaged

because they correlated highly with each other. Next, individual ratings were averaged across participants because no large effect of musical training background was found in either Experiment 1a or 1b. This way, one judgment rating was obtained for each probe tone in each scale, and one judgment rating was obtained for each probe accent in each rhythm. Probe tone ratings was then correlated with probe accent ratings, which gives a predicted goodness of fit measure for how participants would judge the combined pitch and time pattern in Experiment 2. Table 2 shows this goodness of fit measure from Experiment 1.

Similarly, in Experiment 2, the two judgment ratings for each scale/rhythm pair were averaged because they correlated highly with each other. Individual ratings were also averaged across participants because no large effect of musical training background was found. Table 3 shows the ratings of how well the rhythm fit the scale for each of the 49 pairs from Experiment 2. To determine how information about pitch and time combine perceptually, we correlated the goodness of fit measure from Experiment 1 with the judgment ratings from Experiment 2.

If pitch and time are separable dimensions, then the exact scale/rhythm combination should not matter for the cross-dimension judgment. In other words, the correlation between probe tone ratings and probe accent ratings should not predict the cross-dimension judgment ratings. Thus, the expected correlation between the goodness of fit measure and the judgment ratings would be zero if the two dimensions are processed separately. On the other hand, if the correlation is not zero and is significant, then it means that pitch and time are not separable dimensions and that they interact in perception.

Results show a positive and significant correlation between the goodness of fit measure and judgment ratings, $r(49) = .65, p < .0001$. This suggests that pitch and time interact in the perception of music. They interact in such a way that listeners prefer the higher-rated tones to be played on higher-rated temporal positions.

However, listeners in Experiment 2 reported being much more familiar with the major diatonic scale than the others. Consequently, we computed the residuals of listener's judgments after taking out the effect of familiarity. A correlation analysis was conducted to assess the judgments against the goodness of fit measure. Results remain positive and significant, $r(49) = .51, p < .001$. This suggests that after taking the familiarity bias into account, listeners still preferred the higher-rated tones to be played on higher-rated temporal positions.

In addition, the judgment ratings were examined against the surface-level structural match between pitch interval and tone duration. As Table 1 shows, all matched pairs were coded as 1 and the rest as 0. Correlation between judgment and surface-level match was not significant, $r(49) = .05, p = .75$. The surface-level match was also coded in two other ways. One way was to count the number of times the pitch interval and the time interval matched. The other was how many positions matched before the mismatch. Neither of the codings of surface-level match correlated significantly with the judgments of how well the rhythm matched the scale; for the first coding, $r(49) = .03, p = .86$; for the second coding, $r(49) = .17, p = .23$. This suggests that the surface-level structural match does not predict judgments of cross-dimension fit. Instead, it is the match between the underlying tonal stability and rhythmic stability of the tones that predicts judgments of fit.

Discussion

The current experiments explored the relationship between musical pitch and time by focusing on the isomorphism between pitch interval and tone duration. Specifically, scales and rhythms in the diatonic pattern were used as stimuli. Findings suggest that the surface-level structural match did not predict judgments of the cross-dimension fit. Instead, the correlation between the two probe ratings, measuring tonal stability and rhythmic stability, predicted judgments of how well the rhythm fit the scale. The ratings were higher when the higher-rated tones were played on the higher-rated temporal positions in the probe experiments. This suggests that listeners' cross-dimension judgments were governed by their preference for the best-fitting tones in the diatonic scales to be played on the best-fitting temporal locations in the standard pattern. This finding shows that pitch and time are not two separable dimensions. Instead, they interact when joined together.
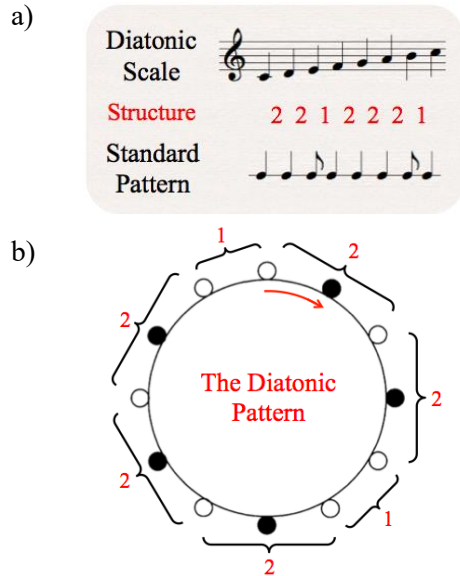
Figure 1. a). Isomorphic structure shared by the pitch intervals of the diatonic scale and the tone durations of the standard pattern. b). Illustration of the asymmetrical and cyclic Diatonic Pattern.

	Scale1	Scale2	Scale3	Scale4	Scale5	Scale6	Scale7
Rhythm1	1	0	0	0	0	0	0
Rhythm2	0	1	0	0	0	0	0
Rhythm3	0	0	1	0	0	0	0
Rhythm4	0	0	0	1	0	0	0
Rhythm5	0	0	0	0	1	0	0
Rhythm6	0	0	0	0	0	1	0
Rhythm7	0	0	0	0	0	0	1

Table 1. Design for Experiment 2 and surface-level coding

Note. Matched pair = 1, mismatched pair = 0

Table 2. Goodness of fit measure constructed by correlating probe tone ratings and probe accent ratings

	Scale1	Scale2	Scale3	Scale4	Scale5	Scale6	Scale7
Rhythm1	.90	.62	.52	.86	.71	.76	.12
Rhythm2	.77	.51	.49	.68	.64	.68	-.05
Rhythm3	.30	.07	.59	.20	.21	.30	.29
Rhythm4	.56	.33	.25	.37	.50	.47	-.17
Rhythm5	.86	.64	.47	.73	.76	.75	.01
Rhythm6	.33	-.16	.22	.45	.06	.08	.14
Rhythm7	.42	.03	.17	.23	.36	.19	-.08

Table 3. Judgments ratings of cross-dimension fit

	Scale1	Scale2	Scale3	Scale4	Scale5	Scale6	Scale7
Rhythm1	27.61	0.39	1.40	4.87	4.61	1.39	-15.95
Rhythm2	41.16	1.81	0.13	9.88	6.55	8.57	-5.83
Rhythm3	13.43	-13.44	-11.24	0.11	-7.96	-9.01	-24.63
Rhythm4	16.69	-0.34	-3.55	12.62	7.00	-5.50	-6.81
Rhythm5	39.27	-0.67	0.17	10.34	6.51	6.30	-9.11
Rhythm6	32.60	-12.54	-5.25	4.71	-9.57	-0.35	-12.99
Rhythm7	10.04	-20.08	-21.19	-7.29	-21.41	-10.13	-24.13

Note. The lowest possible value is -100, meaning extremely bad fit; the highest possible value is 100, meaning extremely good fit.

Acknowledgment

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