Abstracts of the
International Symposium on
Performance Science 2017

Edited by

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LISTAHÁSKÓLI ÍSLANDS
Iceland Academy of the Arts

**International Symposium
on Performance Science**

August 30 | 02 September 2017
Reykjavík | Iceland

Convened by

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Centre for Performance Science, London

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Welcome to ISPS 2017

We are delighted to welcome you to the International Symposium on Performance Science 2017, marking the symposium's 10th anniversary.

Convened at Harpa, the internationally renowned cultural center in the heart of Reykjavík, ISPS 2017 offers opportunities to experience performance firsthand and to examine and discuss performance processes and products. We wish you a productive symposium and an enjoyable and memorable stay in Reykjavík.

Aaron Williamon
Pétur Jónasson

Scientific committee

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Royal College of Music, London (UK)

Pétur Jónasson, *co-chair*
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Conservatory of Bologna (Italy)

Kristín Valsdóttir
Iceland Academy of the Arts (Iceland)

David Wasley
Cardiff Metropolitan University (UK)

Quick reference timetable

Wednesday, 30 August 2017

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14:30-15:00	Break (with refreshments)	Foyer
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10:30-11:30	Poster session I	Foyer
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14:00-14:45	*Workshops* Adaption of the mindfulness-acceptance-commitment approach Music education for infants and toddlers Using music performance to teach universal skills in non-music disciplines	Silfurberg A Silfurberg B Kaldalón
14:45-15:30	*Workshops* Developing community within your choral ensemble Building confidence and self-esteem toolbox workshop for artists Practice methodology: A powerful tool in music performance education	Silfurberg A Silfurberg B Kaldalón
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	Performance demands II	Silfurberg B
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15:15-16:15	*Keynote address*	Silfurberg A
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	If medicine is a performance, then who is the audience?	
	How modern medicine can be cured by studying performance	
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Wednesday, 30 August 2017

11:00-13:00	REGISTRATION Foyer
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Thursday, 31 August 2017

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10:30-11:30	POSTER SESSION I

POSTER SESSION I

Foyer

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Friday, 01 September 2017

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	Árnason, Trouli, Paton The role of lower trapezius in neck, shoulder, and upper-back pain in violin, viola, and cello players (p.162)	Miura Piano proficiency evaluation on audio-visual condition: Audio versus visual / timing versus dynamics (p.164)	Moelants, Van Dyck et al. Visual and auditory cues in music performance and their role in attracting attention from the audience (p.167)
	Halliwell Playing related musculoskeletal disorders in flautists: Risk factors and interventions that may affect outcomes (p.162)	Alessandri, Baldassarre et al. Music critics on the roles and functions of music criticism (p.165)	Harris, Healey Visualizing performer-audience dynamics (p.168)
	Jabusch, Tiedemann et al. Management and outcome of playing-related pain in musicians: A long-term follow up study in 123 patients (p.163)	Morijiri Influences of performance criteria on self-evaluation and external-evaluation: Pianists' decisions on the quality of music performance (p.166)	Pras, Spiro, Schober Audience-based visualization of free jazz improvised performance (p.169)

17:30-18:30	THEMATIC SESSION Performance health and wellbeing II *Chair:* Eckart Altenmüller Silfurberg A Holmes, Munro Investigating awareness and incidence of acid reflux among UK conservatoire student singers (p.170) Wallace, Bird, Jell The impact of footwear, flexibility, and age on injuries across different styles of dance (p.171)	THEMATIC SESSION Performance factors II *Chair:* Elena Alessandri Silfurberg B Reimer, Haneline Personality and performer: Defining a satisfying collaborative relationship (p.172) Mantovani, Gerling, dos Santos The role of repetition in piano practice at varied levels of expertise (p.173)	THEMATIC SESSION Performance signals *Chair:* Isabelle Héroux Kaldalón Ginsborg, Bennett Developing familiarity: Rehearsal talk in a new duo (p.174) Bishop, Cancino-Chacón, Goebl Mapping visual attention of duo musicians during rehearsal of temporally-ambiguous music (p.175)
18:30-20:00	BREAK		
20:00-	CONFERENCE DINNER Iðnó Vonarstræti 3 | 101 Reykjavík www.idno.is		

Saturday, 02 September 2017

08:30-09:00	REGISTRATION		
	Foyer		
09:00-10:30	**SYMPOSIUM** The science of performance careers: A lifespan view of employability in music *Chair/Discussant:* Jane Ginsborg Silfurberg A Bennett The science of performance careers: The rationale for a lifespan view of employability in music (p.177) Araújo, Wasley *et al.* Healthy performers and sustainable careers: The role of individual attitudes, behaviors, and perceptions (p.177) Bennett, Hennekam Is there a career trajectory in music? Music careers through a life-span perspective (p.178) Ginsborg The science of performance careers: Discussion	**THEMATIC SESSION** Insights from dance *Chair:* Pétur Jónasson Silfurberg B Kawano, Kuno-Mizumura Intra-individual and inter-individual variability of upper limb movements of ballet dancers in Swan Lake Act 2 (p.179) Wyon, Allard Bringing a new perspective to vocational dance training: Quality rather than quantity should be the battle cry (p.180) Pickard Choreography as embodied performance (p.181)	**THEMATIC SESSION** Musical development *Chair:* Tânia Lisboa Kaldalón Thomson, Jaque Childhood adversity and the creative experience in professional performing artists (p.182) Guðmundsdóttir The magic hat: On the effect of playful methods on the measuring of 3-year-old children's singing proficiency (p.183) Fonseca, Santiago, Williamson Memory ability in children's instrumental musical practice (p.184)	
10:30-11:00	BREAK (with refreshments) Foyer		
11:00-12:30	**THEMATIC SESSION** Interdisciplinary performance *Chair:* Isabelle Héroux Silfurberg A Brown Measuring knowledge production in music scientia: A bibliometric analysis (p.185) Clark Interdisciplinary experiential learning to facilitate the acquisition of performance strategies (p.186)	**THEMATIC SESSION** Piano practice *Chair:* Laura Stambaugh Silfurberg B Ohsawa, Sawai, Tsuzaki Visual, auditory, and haptic information in the performance of scale and arpeggio tasks in pianists (p.188) James Musculoskeletal architecture and the piano playing technique (p.189)	**THEMATIC SESSION** Violin performance analysis *Chair:* Tânia Lisboa Kaldalón Pardue, McPherson The effects of limiting aural feedback on intonation during violin performance (p.191) Pérez Estimation of bowing parameters in violin playing from audio analysis (p.192)	

11:00-12:30	THEMATIC SESSION (cont.) Silfurberg A Kneebone, Williamon Modeling cross-boundary performance: An innovative research agenda (p.187)	THEMATIC SESSION (cont.) Silfurberg B Shoda, Adachi How pianists manipulate performance parameters across Bach, Schumann, and Debussy: Evidence for performance practice (p.190)	THEMATIC SESSION (cont.) Kaldalón Ornoy Performance styles as manifested in contemporary violin recordings: Preliminary investigations (p.193)
12:30-13:30	LUNCH Foyer		
13:30-15:00	THEMATIC SESSION Performance methods *Chair:* Mayumi Adachi Silfurberg A Goebl The Bösendorfer CEUS system as a research tool for performance science (p.193) Neumann Mixing methods, modeling tradition: Nello Santi and Turandot's riddles (p.194) Kilchenmann, Bechtold *et al.* The Lucerne Groove Research Library: A collection of materials for groove studies (p.195)	THEMATIC SESSION Performance education III *Chair:* Dirk Moelants Silfurberg B Foletto, Carvalho, Creech Violin performance teaching: The role of teaching cues (p.196) Zorzal Teacher-student physical contact as a teaching strategy for musical instruments (p.197) Norgaard, McCranie Far-transfer effects of instruction in improvisation with middle school band students differ depending on grade level (p.198)	THEMATIC SESSION Performer-audience dynamics II *Chair:* George Waddell Kaldalón Healey, Theodorou, Woods Stillness and motion: Two hypotheses about audience engagement (p.199) MacRitchie, Garrido Audience engagement with the arts: Reception across varied orchestral repertoire (p.200) Carvalho A3: An audience of performers (p.201)
15:00-15:15	BREAK		
15:15-16:15	KEYNOTE ADDRESS Steven Schlozman Harvard University If medicine is a performance, then who is the audience? How modern medicine can be cured by studying performance (p.202) *Chair:* Roger Kneebone Silfurberg A		
16:15-17:00	CLOSING REMARKS and ANNOUNCEMENT OF ISPS 2019 Silfurberg A		

Wednesday
30 August 2017

Keynote paper

ASYMMETRY AND SYMMETRY OF ARTS AND SCIENCE

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Background

As we explore symmetry and asymmetry in science, we recognize reflections from the arts and to some extent, a primitive sensation for forms and dynamic actions. Avid scientists immediately associate this with sensational terms of beauty, ugliness, harmony, and vulgarity.

Aims

Does this indicate a common origin of creative thoughts? Does this eliminate the difference between sensation and logic? Does this encourage us to more often swap tools and methods when experimenting and researching arts and science?

Main contribution

In my lecture, I draw attention to where in my experience I see this resemblance from forms of crystalline materials to gait and motion analysis and reveal my mirroring impression of the same in arts. The examples of analogy will be from various forms of arts: music, paintings, movies, and literature.

Keywords

arts; science; symmetry

Thematic session
Practicing for performance

ENHANCED PRACTICE STRATEGIES FOR MUSICAL PERFORMANCE: EVALUATION OF THE LEARNING PROCESS IN ELITE PERFORMERS

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Background

An increasing body of research in both music and sports psychology indicates that repetitive, habitual, and mindless practice often leads to sub-optimal preparation and performance. In contrast, deliberate practice, intrinsic motivation, and a growth mindset can optimise preparation for public performance. Still, the majority of musicians devote their time to blocks of physical practice and mistake-avoidance, as opposed to mental preparation, desirable difficulties, and strategies that strengthen self-efficacy and autonomy. Music teachers may want to steer their students away from mindless drill towards 21st century self-regulated learning strategies, yet both the scientific and pedagogical literature is lacking in alternatives supported by empirical research.

Aims

This exploratory study was designed to capture what musicians *planned* to practice, as well as what they *actually did* in the practice room. In order to separate behavior from thought and emotion, we designed a brief questionnaire (seven questions) to accompany a video recording made of a portion of a practice session. Participants were asked to report their intentions regarding practice focus and planning, then to appraise what they had experienced during practice, and, finally, to access the difficulty of applying this strategy and their motivation to use it in the future.

Method

Fourteen participants, faculty and students in music degree programs at the University of Music and Performing Arts Munich, volunteered for this pilot study to test the effectiveness of the practice questionnaire. Each one completed questions both prior to and following the videotaping of an excerpt of a practice session of their choice. The first three questions (pre-recording) addressed the focus of the practice session, i.e. problem to be solved, the source, and choice of strategy. The last four questions (post-recording) allowed participants to self-rate the effectiveness, newness, ease of application, and usefulness of the strategy, as well as what they were doing, feeling, and thinking during the session. Two professional musicians evaluated the videos in terms of strategy applied and improvement over the session.

Results

Examinations of practice process were conducted, including specificity of goals, problem areas to be addressed (such as accuracy, musical expression), and planned strategies to address problems. Participant self-evaluations of strategy effectiveness were correlated with rater assessments taken from practice video footage. Strong positive relationships were found between: participant-rated strategy effectiveness and rater-assessed mindful deliberate practice (r=0.66, p=0.01) and degree of progress (r=0.59, p<0.05); as well as rater-assessed degree of progress and deliberate practice (r=0.95, p=0.001).

Conclusions

Breaking any cycle of less than optimal practice requires the adoption of new strategies that augment or replace old habits. To do this one must self-regulate, by identifying patterns in behavior that are based on habits, and then actively working to modify these routines. This study provides preliminary evidence for the efficacy of a short protocol which encourages musicians to improve practice outcomes through self-regulated skills in practice planning and observation for proactive learning and enhanced performance.

Keywords

musicians; practice strategies; self-regulated learning; self-efficacy; motivation

A LONGITUDINAL STUDY OF THE DEVELOPMENT OF EXPRESSIVE TIMING

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Background

An important part of the performer's role is to convey the musical structure of a piece to the audience. One way performers do this is by slowing down at beginnings and ends of phrases and sections, creating tempo arches. Tempo arches have been reported for a wide variety of pieces, styles, instruments, and performers. They are often attributed to simple, basic processes, such as slowing down in order to stop, and grouping movements together into larger action sequences. However, all the performances examined have been highly practiced, ready for the public stage. There have been no studies of how tempo arches develop during the preparation of a new work for performance. Are tempo arches present from the start or do they develop gradually?

Aims

We examined the development of tempo arches by recording every performance, both in practice and in public, over a two-year period during which an experienced concert soloist (the first author) prepared a new work for public performance and gave multiple public performances. We also examined the landmarks used by the musician to track her progress through the piece. We refer to these landmarks as "performance cues" (PCs) and identified them by asking the performer to report the musical features that she attended to during performance. PCs provide a performance-centered way of segmenting the piece, complementing the more abstract description provided by the musical structure.

Method

We measured the bar-to-bar tempi of the 28 performances recorded by the cellist as she learned and gave six public performances of the Prelude from J.S. Bach's *Suite No. 6* for solo cello. After the last performance, the cellist reported the locations of phrase and section boundaries, and PCs, distinguishing PCs for expression, interpretation, and basic technique. We used mixed effect models to examine the development over time of tempo arches and effects of the PCs.

Results

Tempo increased over time, reflecting the technical difficulty of the music, which required the cellist to practice slowly at first. Arches for both phrases and sections appeared early in practice and changed shape over time, initially becoming more pronounced and then less pronounced and more asymmetrical. PCs referring to expressive and interpretive landmarks were mostly located at starts of phrases and sections. Slowing at these locations was more pronounced than in locations not marked by PCs and increased as the performances become more polished.

Conclusions

The development of tempo arches followed a complex trajectory. The arches waxed and waned and changed shape over time, rather than developing monotonically. This suggests that arches cannot be explained by simple mechanical principles common to any action or by simple cognitive grouping processes. The complex developmental trajectory of tempo arches, and their shaping by PCs, suggests that the tempo arches were, at least in part, products of the performer's extended interrogation of the score during practice, involving complex decisions about the aesthetic and technical possibilities of the piece.

Keywords

practice; spontaneity; performance cues; expression; performance

A MODEL FOR THE CREATIVE PROCESS IN THE SHAPING OF A MUSICAL INTERPRETATION: THE STUDY OF NINE EXPERTS

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Background

When interpreting music, the professional musician must demonstrate technical mastery, expressiveness, and originality. Previous research using expert musicians has helped define what constitutes effective rehearsals, identified the elements of musical expression and how to communicate them, and described the work steps used by experts to prepare a piece of music. Creativity in music interpretation has been studied, but the primary interest has been in the products, or outcomes, of creativity: the recordings and the performances. Recent research has investigated the creative process underlying the shaping of an interpretation by professional musicians as a craft and on the cognitive processes involved. This study used methodology developed by Héroux and Fortier to study, in situ, the creative process in rehearsals.

Aims

The aim of this research was to investigate how nine expert musicians worked through the interpretation of the same novel music for an audio-recording. This study uncovers the creative process underlying the shaping of an original interpretation. Through this study, we uncovered the creative process underlying the shaping of an original interpretation.

Method

Data collection was conducted by videotaping rehearsals with verbalization, combined with a reflexive questionnaire, and the description of the musicians' actions by a third-party observer. The data was first analyzed through a content analysis with NVivo 8. Then, interview techniques borrowed from phenomenology were used, i.e. self-confrontation interviews and explicitation interviews, which enabled the verbalization of the action a posteriori. Grounded theory analysis was used to analyze the data from a phenomenological point of view and to propose a general model.

Results

We found that the musician (e.g. values, knowledge), the music (e.g. style, technical aspects, music material, etc.), and the constraints (e.g. time, professional, etc.) impact the strategies used. We identified common creative processes related to those already discussed in the literature, for example, alternation between divergent and convergent thinking, creative associations, and artistic appropriation. We propose a model of the creative process that takes into consideration the literature about how musicians work on music (mental representation, work stages) and our results; the context, the artistic appropriation, the strategies, and the creative processes used.

Conclusions

The proposed model contributes to a better understanding of the creative process underlying the work of performers. This model could lead to new avenues of research in performance practice studies, in creativity, and in music interpretation pedagogy.

Keywords

creativity; interpretation; expertise; phenomenology; performance

Acknowledgments

Thematic session
Performance education I

A COMPARISON OF JAPANESE AND AMERICAN SECTIONAL REHEARSALS IN SCHOOL CONCERT BAND ENSEMBLES

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Background

American and English military bands greatly inspired the development of Japanese bands. With the influence of United States Navy Commodore Matthew Perry who helped bring about the end to Japan's 215-year period of isolation in 1853, Japan was first introduced to a Western-style military band. The first school band in Japan was established in Kyoto in 1912. Following World War II, Japanese military bands became self-defense bands and the presence of several American bands in post-war Japan created a surge of interest. Japanese school band clubs learned well from United States bands and eventually their performance skills surpassed those from the United States. In the last 30 years, Japanese bands have had a large effect on how band is taught in the United States. Japanese bands' use of Just Intonation for harmonic tuning (using the Yamaha Harmony Director tool), student led instruction, peer mentoring (Senpai-Kohai), character training, self-regulation, and international performances at American music education conferences have greatly influenced how instrumental ensembles in the United States are currently taught.

Aims

The aims of this presentation will be to elucidate how Japanese band students participate in constructivist self- and peer-regulated learning, and contrast that with bands in the United States that usually participate in instructor-led music ensembles.

Main contribution

Video frames of sectional rehearsals will be presented to demonstrate the contrast between pedagogy, culture, skill, self-regulation, classroom management, peer mentoring, tuning, balance, teacher involvement, and peer interaction.

Implications

Student led Japanese band sectional rehearsals demonstrate that a constructivist self- and peer-regulated band culture results in increased performance skills, on-task student participation, peer feedback, independent problem solving skills, and higher expectations and standards.

Keywords

self-regulation; band; constructivist; problem-solving

BALANCING PERFORMNG AND TEACHING ROLES: THE VOICE OF CLASSICAL SINGERS

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Background

How do classical singers combine performing and teaching, two highly challenging and consuming careers? The life of a performer combines reward with intense commitment. Furthermore, for the classical vocalist whose body is the instrument, maintaining good health is a priority. Teachers of singing have demanding roles, with the responsibility of guiding their students' vocal technique, in addition to providing inspiration, emotional support, and career guidance. Moreover, their work can be taxing on their voices. Research pertaining to musicians who balance teaching and performing is not abundant, however there are contributors. The literature reviewed did not present a study that focused solely on classical singers, whose operatic engagements can be lengthy and travel-orientated. This gap in the literature provides an opportunity to further contribute to the field and examine the relationship between successfully balancing a performance and teaching career for classical vocalists.

Aims

To determine: (1) how classical vocalists with extensive performance schedules maintain a commitment to their studio teaching, and (2) how teachers of singing who manage large private studios, and/or teach at high level music institutions, balance performance careers with their responsibilities to their students.

Method

A qualitative method was selected for my research, using a phenomenological approach to devise a questionnaire and analyze data. The approach to selecting the sample group was to invite participants representing a wide variety of professional involvement in both teaching and performing. In addition, diversity with regards to gender, base location, and experience was also taken into account. Fifteen potential participants were contacted via e-mail. Two participants were interviewed, one via telephone and one in person. Eight participants responded via e-mail.

Results

Participants were invited to discuss the following themes: balancing performing obligations with commitments to students, benefits of performing on pedagogy, and maintaining vocal health. Careful planning, prioritizing their predominant work, and the benefits of performance on their teaching were emphasized by participants. With regards to vocal health, vocal warm-up prior to teaching, the importance of maintaining good health with sufficient sleep, emotional stability, and self-preservation were examined. Additionally, participants considered their motivations for balancing a performance and teaching career.

Conclusions

All the participants felt that performing was essential to their teaching, and a few highlighted that they felt their teaching benefited their performing and technique. There were commonalities shown by participants with busy performance schedules, who accommodated teaching in their scheduling gaps. Furthermore, singers holding full-time positions at institutions tended to prioritize their students over their performing. Interestingly, the elite singers whose monetary needs were met through performing still chose to teach. Participants illustrated how combining performance and teaching results in joy, creativity, sharing, tensions, and adrenaline, summed up by one of the singers: "It's a crazy life but it's a good one, and it's worth it!!! The performing part is worth it and also the sharing of what you learn along the way is so, so gratifying I find."

Keywords

vocal; pedagogy; performing; singing; teaching

CAREER DECISIONS OF FUTURE PROFESSIONALS: THE REALITY AND BARRIERS TO TRADITIONAL PERFORMANCE CAREERS

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Background

Work Integrated Learning (WiL) programs, such as a music professional practice internship, are a great weapon in the arsenal of transitioning student to professional. The employability of graduates is often challenging in the music performance discipline as not all undertaking a tertiary degree in music are successful in being employed in a traditional orchestral context. WiL programs are well documented in providing students with skills for successful future careers; however much literature relates to disciplines such as Engineering, Education, Health Sciences, Medicine, and Business/Law. Transitioning to work for student musicians requires collaborative action from Arts organizations, the higher education provider, and the student.

This paper reports an empirical study of 10 Australian undergraduate music performance students, enrolled in a professional practice internship, who described how their experiences of work informed a sense of "becoming" a professional musician. The sense of self-model provides a theoretical approach in analyzing data taken from student created portfolios (the product), written during the WiL program. Students reflected on the adaption of theory to practice through a process of experiential learning. Exploring student engagement through this lens provides insight into the transformative processes for developing a sense of "professional" musician self.

Aims

This study explores the learning journey of 10 undergraduate music students' undertaking a WiL program (internship) in Sydney, Australia. The students created reflective written portfolios with evidence of experience, practice, performance opportunities, and learning. The research question was: How do undergraduate music student's reflections on a WiL program (internship) experience of work in a traditional orchestral setting inform their sense of self and "becoming?"

Method

This research gathers 10 students' stories about the impact of an 8-week internship experience in a professional Opera and Ballet orchestra. As an observational study case study, the inquiry of "how" and "why" a phenomenon occurs is viewed from multiple standpoints exploring meaning and similarities/differences between students' experiences. Grounded Theory allows an emerging theory to develop from collection, sorting, and analysis of data, and allows the identification of themes. The written reflection or "stories" and evidence found in the portfolio allowed adoption of a phenomenological perspective within a narrative framework as data were expressed in words, sounds, and images. Students gave permission to use their portfolio stories.

Results

The study indicates that reflective writing assisted students' sense of "becoming" and deeper understanding of skills required for successful future professional musician employment. The process of reflective writing and creating a portfolio of evidence assisted the students, employability skills such as communication, problem solving, etc. The sense of self-model enhanced understanding of becoming in a learning context where emphasis is on arts practice rather than professional identity formation. The discussion is around the identity traits that emerged from the data and the reality of musician's portfolio careers.

Conclusions

This study provides information for music educators about constructive ways to transition student to professional and provides an exploration of how WiL programs implemented within tertiary music study impact future careers. The alignment of career decisions is based on the reality of barriers to traditional performance career pathways.

Keywords

work-integrated learning; higher education; employability; musician identity; career

Thematic session
Performance education II

PEER LEARNING IN INSTRUMENTAL PRACTICING

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Background

In music academies and conservatories the notion of "private teaching, private learning" has a long tradition. The instrumental teaching involves one-to-one lessons provided to a student by a teacher, and the learning part rests on the individual practicing of the student between studio lessons. This privatized conception of teaching and learning musical skills also rests on the belief that the studio lessons prepare for the student's individual practicing sessions. Although earlier research in general reveals a strong relationship between the instrumental lesson and individual practice, efforts are being made to develop and understand collaborative learning practices in higher music education. Hence, there seems to be a need to explore collaborative learning such as peer learning in instrumental practicing in music academies and conservatoires.

Aims

The presentation focus on peer learning in instrumental practicing, and the main questions are: (1) To what degree do students report engaging in peer learning related to their instrumental practicing, and how is this related to gender, musical genre, and study program? (2) To what degree do students report various kinds of peer learning as influential to their instrumental practicing, and how is this related to gender, musical genre, and study program? (3) To what degree does engaging in peer learning relate to how satisfied the students report being with their own practicing and their perceived success as performers?

Method

Participants were bachelor music students in performance education programs enrolled in a music academy (N=96). All students could be classified as advanced students, and they were invited to respond to an electronic questionnaire about how they perceived their practicing in general, and more specifically, how they engaged in peer learning in instrumental practicing.

Results

Overall, the students reported engaging in peer learning related to their instrumental practicing to various degrees. This involved sharing and discussing practicing matters with peers and spending time practicing with peers. To various degrees they also reported their own practicing habits to be influenced by peers. Based on the students' reports, we also found the general attitude that discussing practicing was perceived as more beneficial than the amount of time reported doing it would indicate. When looking into any differences in peer practicing with regard to gender, musical genre, and study program, the picture became more complex.

Conclusions

Based on our findings, we draw the careful conclusion that there might be an unexploited learning potential for music performance students in using each other as resources in instrumental practicing to a higher degree than the present study implies. In order to enable and develop collaborative learning practices that emphasize sharing of knowledge and experience, we suggest that higher music institutions in their study programs facilitate for and emphasize the importance of team and group efforts.

Keywords

instrumental practicing; peer learning; advanced music students; genre; gender

A COMPARISON OF BURNOUT AND ENGAGEMENT IN MUSIC PERFORMANCE STUDENTS AT CONSERVATOIRES IN AUSTRALIA, POLAND, AND THE UK

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Background

Various aspects of the psychological health of music performance students have been examined but little is known of their levels of burnout and engagement. Employees across the world appear to differ with respect to their levels of burnout and engagement, which could be attributed to unique cultural values and working conditions characterized by their environments. Similarly, students in different countries may vary in their experiences of burnout and engagement. Likewise, there may be differences between men and women with respect to music-related burnout and engagement, associated with educational practices reinforcing gendered stereotyping.

Aims

The study aimed to establish and compare the levels of burnout and engagement in music performance students in Australia, Poland, and the UK, and between men and women.

Method

A total of 332 music performance students at conservatoires in Australia (n=66), Poland (n=142), and the UK (n=124)—men (n=99) and women (n=233)—responded to a questionnaire comprising quantitative measures of burnout and engagement, administered at a similar time of the academic year. Levels of burnout and engagement were established on the basis of average scores. Kruskal-Wallis tests with pairwise comparisons and one-way ANOVA with pairwise comparisons were used, where appropriate, to test for differences in students' burnout and engagement by country. Mann-Whitney tests or t-tests were run, where appropriate, to assess differences in burnout and engagement by sex.

Results

The levels of burnout were comparatively low. Nevertheless, one in ten respondents was classed as burned-out. Differences emerged between respondents in Poland and the UK, in that the latter reported higher levels of global burnout, emotional and physical exhaustion, and devaluation. Emotional and physical exhaustion and devaluation were higher in the Australian than the Polish group. Students in Australia displayed lower levels of reduced sense of accomplishment than their counterparts in Poland and the UK. Women had higher levels of global burnout than men, who reported lower reduced sense of accomplishment. Levels of engagement were moderate to high. Global engagement, vigor, and dedication were higher in the Polish than the UK group, and dedication was higher in the Polish than Australian group.

Conclusions

While the study paints a positive picture of the music-related well-being of performance students, it suggests that some of them are at risk of feeling burned-out. The study thus highlights the importance of educating students and teachers about the symptoms of burnout and helping them develop the strategies to cope with them. Differences in musical training may be partly responsible for the cross-national and sex variations in the music-related well-being found.

Keywords

burnout; cross-cultural; engagement; sex differences; tertiary education

TEACHING THE PERFORMING BODY AND MIND: STUDENTS' PERSPECTIVES ON HEALTH PROMOTION IN POST-SECONDARY VIOLIN STUDIO LESSONS

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Background

In response to growing recognition of the need for better health education in music training, post-secondary music schools are increasingly incorporating general courses on health and wellbeing into their curricula. Research suggests, however, that it is the studio instructor who plays the most influential role in a student musician's development. Beyond simply shaping their musicality, the instructor guides the student's physical approach to their instrument, their practice habits, and their understanding of health as it relates to performance. Research also indicates that when students become injured, they typically go first to their studio instructor for advice, emphasizing the instructor's potential to play a pivotal role in encouraging healthy practices in their students. To explore this opportunity, the current study focuses on taking advantage of the influential role of the studio instructor by integrating health promotion concepts into the studio lesson environment.

Aims

This research explores students' perspectives on and experiences with the inclusion of health promotion education in post-secondary violin studio lessons.

Method

A multiple case study was undertaken with six post-secondary violinists, all of whom participated in eight one-hour violin lessons with the primary researcher. The lessons were designed to cover the repertoire and musical interests of the participant's choice while also incorporating five concepts selected by the researcher to help promote healthy practices (warm-ups/cool-downs, body awareness, anatomy education, effective practicing techniques, and psychological wellbeing/mindfulness). Participants completed questionnaires before and after the series of lessons, as well as an interview upon completion of the study that explored their experiences in greater depth and discussed the strengths and weaknesses of this approach.

Results

While there was significant diversity in participants' responses to the lessons, all participants overwhelmingly reported positive experiences with the lessons, expressing enthusiasm for exposure to concepts which had until then been absent from their musical training. As a testament to the value of these concepts, many participants recounted adopting the newly introduced practices into their own routines, and perhaps even more significantly, into their own teaching. Within the wide variety of beneficial elements cited, a theme emerged in which participants' highlights consistently involved concepts they perceived as having a direct impact on their playing. These findings reinforce the value of explicitly relating health promotion concepts to the music and tailoring these concepts to address the student's individual needs.

Conclusions

The studio lesson presents a powerful opportunity for promoting health in musicians. As this study demonstrated, the goals of the lesson, which typically center around achieving peak performance, can be congruent with those of health promotion. To this end, it is important for students that health promotion instruction explicitly relates to their musical objectives. Just as the studio lesson format allows the instructor to respond differently to the unique musical and technical needs of each student, so too must health promotion be tailored to the student for maximal impact.

Keywords

performers; health promotion; injury prevention education; pedagogy; studio lessons

Acknowledgments

Symposium
Technology Enhanced Learning of Musical Instrument Performance (TELMI)

HACKING PRACTICE: TECHNOLOGY USE AND ATTITUDES IN MUSIC LEARNING

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Background

The rapid expansion and adoption of technology across all facets of society is well documented, simultaneously driving new opportunities for growth while provoking worry for the unintended consequences of their deployment. This has been felt keenly in education. Students have ever-greater access to information, but can be overwhelmed by choice and distractions. Teachers have new tools to enhance their communication, but often lack training, support, and time to employ them. And organizations have ever more systems to monitor and assess outcomes, potentially promoting growth while increasing teachers' and schools' data-collection burden. While this expansion of technologies into the music education classroom has been studied in great depth, there is a lack of published literature regarding the use of digital technologies by students and teachers in one-to-one instrumental music instruction settings. Do musicians take their technology use into the practice room and teacher's studio, or does the traditional nature of the master-apprentice teaching model promote differing attitudes of musicians towards their use of technology in learning their instrument?

Aims

This presentation examines the following: (1) the degree to which musicians engage with technology in the learning of musical instruments; (2) whether these attitudes and behaviors reflect those of their day-to-day life; (3) musicians' attitudes towards potential new technologies and what factors predict adoption of new technologies; and (4) how these results interact age, experience, and instrumental group.

Method

To investigate these questions, the authors developed the Technology Use and Attitudes in Music Learning questionnaire. It comprises six sections: (1) standard demographic descriptors including age, instrument, nationality, musical experience, etc.; (2) a violin-specific page investigating behaviors related directly to the TELMI project; (3) use of, access to, proficiency with, and attitudes towards technology in day-to-day life, incorporating a revised form of Davis' scales for Perceived Usefulness and Perceived Ease of Use of Technology; (4) a repetition of the previous section but directed towards musical activities; (5) attitudes toward hypothetical future technologies in music learning driven by the TELMI project; and (6) a section for instrumental teachers only examining whether their responses differ between their dual roles as student and teacher. Musicians (N=213; instrumental and vocal) aged 16+ completed the survey online. Survey responses were supported by semi-structured interview data from a sample of violin students and teachers in which their specific use of technology in learning and teaching was examined in detail.

Results

Results support Davis' 1989 Technology Acceptance Model (TAM), wherein technology use in music learning is predicted by perceived usefulness and ease of use. The majority of existing technology use (i.e. metronomes, tuners, audio/video recording) was undertaken on smartphones rather than bespoke devices, and while audio recording is relatively common, reviewing these recordings is completed with less regularity. Attitudes towards adopting new technologies were relatively strong and not predicted by age, experience, or instrument group.

Conclusions

New technologies, through advanced and interactive systems of behavioral analysis and feedback, have the potential to enhance communication, efficiency, efficacy, and healthy practice in music learning. By understanding the challenges faced and attitudes held by musicians that may be impeding the take-up of such systems, researchers and designers will be able to develop genuinely useful technologies for the next generation of performers.

Keywords

technology; musicians; education; attitudes; behaviors

A MARKET ANALYSIS OF MUSIC LEARNING: CHALLENGES AND OPPORTUNITIES

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Background

As the Exploitation Coordinator for the TELMI (Technology Enhanced Learning of Musical Instrument Performance) project, Saico Intelligence SL is responsible for exploring the transfer of project technologies into the market. To this end, Saico has developed the R&D2Value Methodology for technology transfer, which is being applied and refined within the TELMI project. This methodology is based on knowledge and experience gained across numerous R&D projects, several of which have grown into successful technology businesses. In contrast to other existing Technology Transfer Methodologies, the R&D2Value is simple enough to be implemented within research projects and flexible enough to be applied to a variety of Information Technology (IT) scenarios. In brief, this methodology consists of a number of stages and processes classified into two main phases: the Research and Development (R&D) phase and the Market Launch phase. Market research represents a fundamental component within R&D, helping reduce potential risks when defining the scope and strategy of technology-based products.

Aims

The main objective of this paper is to present market research examining technologies available for music learning. We will discuss the most relevant market categories identified and the opportunities foreseen for the TELMI project.

Method

An online search was conducted for commercially available products using relevant keywords surrounding music learning. Information collected on each product included the name, company, website, location, platform(s), content, general functionalities, target users, internationalization, third-party involvement, alliances, business model, and pricing. An iterative process was used in which categories and sub-categories were refined as data were collected. Products were identified not only for their use of fundamental technology, but also for their business model, their gamification functionalities, or similar features considered parallel to the goals of the TELMI project. By examining the existing literature of broader markets, such as e-learning or video games, we strove to identify future trends and to make projections within our more detailed market analysis.

These data will be supported by interviews with customers and providers to fully understand the business models. We will also research available statistical data from national and European bodies to evaluate the market size.

Results

We have currently analyzed over 70 products that currently exist in the market, and we have defined a complete list of categories for market segmentation including Target Groups (Self-learners, Professionals, School Teachers, School Students, Conservatory Students, Conservatory Teachers, Musical Bands/Orchestras [amateurs] and Musical Bands/Orchestras [professionals]) and Content (Piano, Guitar, Violin, Music Theory, and Others). Preliminary examinations of the data are revealing development trends, such as the digital platforms commonly used among specific target groups.

Conclusions

We have identified the main agents concurring in the music learning market and organized them in a value chain. We have identified potential opportunities for the project technologies and potential partners for establishing collaborations. We have contributed to the orientation of the ongoing research efforts in TELMI project. In addition to the specialist research described above, this presentation will demonstrate how such methodologies can be used to create R&D projects that address the challenges and opportunities existing markets offer.

APPLYING CO-CREATION PRINCIPLES TO DEVELOP A TECHNOLOGY-ENHANCED LEARNING SOLUTION FOR VIOLINISTS

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Background

Co-creation is "an act of collective creativity, shared by two or more people." The participants are experts in their fields, working together towards an innovation that will address a concrete need. This can include face-to-face techniques such as workshops and interviews complemented with asynchronous techniques such as online surveys. The added value of the co-creation approach lies on the fact that people are allowed to create their own solutions. Consequently, evidence suggests that acceptance and implementation of the produced services is both quicker and greater.

Aims

In the TELMI (Technology Enhanced Learning of Musical Instrument Performance) project, the aim is to develop a technology-enhanced solution that goes beyond the development of technical skills. This paper presents the adopted development approach based on co-creation principles, which involves students, musicians, and teachers throughout the process.

Method

TELMI adopted a customized approach to its co-creation process to address its unique needs and purposes. A series of interviews and workshops with violin students and teachers were carried out where the participants were involved in brainstorming sessions. The main aim was the in-depth exploration of the use of technology in instrumental learning and teaching. To enable the discussion and the idea exploration a set of storyboards with hypothetical and prototype technology systems was employed. In addition, other co-creation methods were used such as problem definition, personas, timelines, and scenarios. The storyboards, along with supporting tools, were iteratively refined from each engagement with the different stakeholders, evolving from scripts to elaborated visual vignettes.

The purpose of the storyboards was to support the engagement with the stakeholders concerning key functionalities to support and explore their acceptance with regards to the use of TELMI in their daily activities, driven by the underpinning pedagogical model. Although different stakeholders emphasized different parts of the features captured in the storyboards, the feedback from the students and teachers quickly reached saturation where no further progress was achieved concerning the design of the solution. At this stage, the next step was to move from usage to the design by sketching the system's interface. Static sketches are being integrated into an interactive mock-up that will be used to elicit discussion with subject matter experts. This minimal viable product will be evaluated and assessed by both students and teachers.

Results

As a result of the co-creation process, three fundamental modes of interaction have been envisioned for the TELMI learning solution: (1) Student Practice Mode, when the student is practicing on his own (no teacher present); (2) Lesson Mode, when the student is having a one-on-one lesson with a teacher; and (3) Studio Mode, when the students are asked to review and evaluate each other's performances. Each of these will be presented.

Conclusions

The use of co-creation principles has demonstrated that several of the initial design principles were erroneous and required further exploration towards eliciting a deeper understanding that results in a solution of greater value to the targeted users. The next steps in the project involve further workshops where the minimal viable product is to be assessed and evaluated by the students and teachers.

Keywords

co-creation; technology enhanced learning; violin instrumentation; music education

CAPTURING HIGH-QUALITY VIOLIN PERFORMANCE DATA

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Background

The increased availability of sophisticated audio, video, motion, and physiological capture technologies enables numerous quantitative approaches to the analysis of violin performance. Previous research has examined bow control, performers' movement, and the resulting sounds produced, though often in isolation and without widespread incorporation in an applied pedagogical framework.

Aims

The TELMI (Technology Enhanced Learning of Musical Instrument Performance) project, which aims to develop novel multimodal interaction paradigms and technologies for learning to play violin, requires an initial reference archive of professional performances collected using state-of-the-art capture methods. This presentation outlines the methods used to capture these performances, including the processing and analysis of the resulting quantitative data.

Method

Four professional violinists were recruited in collaboration with the Royal College of Music. Recordings were captured at Casa Paganini, Genova, Italy. They consisted of motion capture data (performer, violin, and bow), instrument and ambient audio, video (frontal and lateral view), and data from physiological sensors (EMG). Equipment included: (1) a 13-camera Qualysis motion capture system; (2) two JVC-GY-HD251 video cameras (720p, 50fps); (3) one Microsoft Kinect v.2, capturing both live video and depth-map; (4) one wireless, violin-mounted FISHMAN-PRO-V20-0VI microphone; (5) two NEUMANN-KM184 microphones for ambient audio; and (6) two Myo sensors for EMG data. The violinists recorded 41 custom and pre-existing exercises covering different violin skills (e.g. bow speed, string crossing, staccato articulation, etc.). After briefing on the technical setup, each performer was dressed in a motion capture suit of appropriate size and provided a violin fitted with the various capture devices. They were given time to acclimatize to the required conditions, after which the system was calibrated and a recording test performed. The main recordings followed, during which players were free to choose the order and number of individual takes. They were also given the opportunity to check the recordings after the session and to rerecord exercises with which they were not satisfied.

Results

The recorded material was post-processed and uploaded in the repoVizz repository (https://repovizz.upf.edu/repo/home).

Conclusions

The recorded archive will provide the TELMI project with a basis for several future activities, including developing computational models of the performances, testing algorithms for feature extraction, and designing feedback for violin students. In addition to outlining the applications of such rich performance data, the presentation will address the challenges faced in attempting to capture authentic performances in high-technology settings and how these were addressed.

Keywords

violin performance; quantitative analysis; reference archive; multimodal recordings

Acknowledgments

A COMPUTATIONAL APPROACH FOR MEASURING PERFORMANCE QUALITY IN VIOLIN TONES

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Background

Automatic assessment of music performance is an open and widely studied research area. Its great challenge, however, is in capturing the complexity and subjectivity of the musical material and of traditional methods of human assessment. Rather than strict, quantifiable criteria, assessment in music education relies on consensus of experts who, while highly trained, produce subjective interpretations of music performance. Even reducing musical performance to its simplest component part—the single tone—still carries these challenges. From a technical perspective, the quality of a performed sound is a result of numerous acoustic properties including pitch, loudness, and harmonic spread. The language used by musicians to describe tone, however, can be highly personal without clear parallels to the psychoacoustic properties they describe.

Aims

Our aim is twofold: (1) to understand the correlations between the human tone quality descriptors, acoustic descriptors from the literature, and the features extracted from the audio signal; and (2) to generate machine learning models to predict the different proposed quality dimensions of the performance from the audio features. The predictive models will be implemented and incorporated into a real-time feedback learning system.

Method

Perceptual tests on the quality of performed musical notes were performed using previously defined terms used in the literature to assess sound quality (i.e. pitch-dynamic-timbre stability, richness, and attack clarity), as well as a proposed list of tone qualities provided by music experts in violin education. A perceptual test to assess the quality of the performed notes was conducted. Participants were asked to mark sound quality in terms of the predefined dimensions on a 7-point Likert scale. Similarly, the proposed list of tone qualities was presented in pairs to the listener (e.g. bright/dark) to grade the sounds along a 7-point Likert scale. Low and high-level audio features were extracted from the audio signals in both temporal and spectral domains using the Essentia library. Machine learning techniques were used to generate models to predict the different quality dimensions from the extracted features.

Results

From the perceptual tests data correlation was evaluated among the different proposed perceptual sound quality dimensions. Preliminary results show that higher correlations (i.e. CC>0.8) were obtained between the overall quality of the sound and pitch stability/timbre richness. Similarly, the same high correlation was found among the proposed tone qualities: grainy/pure with coarse/smooth, and restricted/free with narrow/broad. The models with best predictive accuracy were obtained for pitch stability, dynamic stability, and timbre stability. A first prototype of the real-time system for performance quality assessment was implemented, able to track pitch, dynamic, and timbre stability/accuracy.

Conclusions

A computational approach to automatically assess the quality of performed violin sounds is proposed. High and low-level descriptors were extracted from the audio signal and machine learning models were obtained to predict the different quality dimensions from the audio features. Preliminary results indicate different levels of correlation among the studied quality dimensions. Potential applications in music education settings, including those within the TELMI (Technology Enhanced Learning of Musical Instrument Performance) project, will be discussed.

Keywords

automatic music performance assessment; music performance modeling; machine learning; violin sound quality

TELMI WORKSHOP: DEMONSTRATION OF THE FIRST PROTOTYPE

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Background

The TELMI (Technology Enhanced Learning of Musical Instrument Performance) project seeks to design and implement new interaction paradigms for music learning and training based on state-of-the-art multi-modal (audio, image, video, and motion) technologies. Following 18 months of initial research and development, the project partners have developed first prototypes that will be used for testing and refinement.

Aims

This workshop will demonstrate the first prototype of the TELMI system, encouraging participation and feedback from ISPS delegates in a parallel interactive installation.

Main contribution

The workshop will open with a brief description of the mechanisms and capabilities of the TELMI prototype. This will include live demonstrations by violinists. ISPS delegates with any level of previous violin experience will then be invited to try the system themselves in a public installation, performing basic tests of violin skill under the guidance of the expert workshop violinists and pre-defined exercises within the system.

Implications

Engagement with the TELMI prototype will give ISPS delegates hands-on knowledge of the possibilities offered by the state-of-the-art in performance capture and interactive technologies. Comments and feedback collected from the delegates will contribute to further development of the system.

Keywords

TELMI; prototype; demonstration; technology; violin

Symposium
Musical Impact I

MUSIC STUDENTS' HEALTH AND WELLBEING: ATTITUDES, BEHAVIORS, AND PERCEPTIONS

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Background

Research has shown that musical practice and performance can expose musicians to pain, musculoskeletal, and psychological problems, which may prevent them from realizing their full potential. While developing and perfecting musical and technical skills are undoubtedly important, other skills and behaviors, such as building psychological resilience and promoting one's health, are needed to respond effectively to the challenges of the profession.

Aims

This presentation explores music students' heath related attitudes, perceptions, and behaviors, in particular how different they are from the general population in aspects of health and wellbeing, and what determines music students' health and wellbeing.

Method

483 undergraduate and postgraduate students from ten conservatoires (mean age=21.29 years ±3.64; 59% women) took part in a comprehensive screening protocol that included a set of questionnaires to measure wellbeing, health-promoting behaviors, perfectionism, coping skills, general health, sleep quality, and fatigue. T-statistics were used to identify gender differences and to compare musicians with the general population, and multiple linear regression models were explored to predict wellbeing, general health, and health-promoting behaviors.

Results

Results indicated that music students have higher levels of wellbeing and lower fatigue than the general population. However, they also reveal potentially harmful perceptions, attitudes, and behaviors toward health. Specifically, engagement in health responsibility and stress management was low, which along with high perfectionistic strivings, limited use of coping skills, poor sleep quality, and low self-rated health, paints a troubling picture both for the music students and for those who support their training. Wellbeing was predicted by gender, fatigue, engaging in spiritual growth and interpersonal relationships, perfectionistic concerns, and coping (active coping and planning). Health-promoting behaviors were predicted by gender, wellbeing, adaptive perfectionism, and coping skills (positive reframing and use of instrumental social support). Sleep, fatigue, engagement in physical activity, and health responsibility predicted self-rated health.

Conclusions

While results indicate that music students' attitudes and behaviors are fairly typical when compared with similar age groups, it also raises questions on the potential impact of these behaviors to music learning and performance. There are three main contributions of this study: (1) it identifies a need for action in promoting healthy behaviors among music students as well as in developing healthier settings; (2) it also stresses that psychological skills training, in particular stress management is needed; and (3) it shows that despite all the physical and psychological demands, music students seem to feel well and have a sense of belonging in their lives, and therefore opportunities to sustain wellbeing within education and professional settings should be fostered.

Keywords

health; wellbeing; perfectionism; coping; lifestyle

Acknowledgments

PHYSICAL AND FITNESS PROFILE OF MUSIC STUDENTS: COMPARISONS WITH NORMATIVE DATA AND DIFFERENCES BETWEEN ACADEMIC LEVEL AND INSTRUMENT GROUP

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Background

To perform at the highest level, musicians are required to be physically and mentally fit and are often referred to as athletes of the upper body. It would be expected, therefore, that musicians show superior upper body fitness and excellent physical skills. However, little is known about the actual fitness levels of musicians that may be required to meet these physical demands and that could explain the alleged "athletic" abilities of musicians. The majority of existing findings result from subjective and general self-report measures and therefore a gap exists in terms of data produced from objective and specific measurements of musicians' fitness and engagement in physical activity.

Aims

This presentation reports the outcomes of a study investigating the specific fitness profile of music students comparing against normative values.

Method

483 music students (mean age=21.3±3.64) were recruited from ten conservatoires in the UK and Switzerland. At the time of participation in the study, 322 were undergraduate students (Year 1 n=233, Year 2 n=33, Year 3 n=31, Year 4 n=25, 54% women), and 161 were postgraduate students (69% women). Each completed a comprehensive screening protocol which included measures of strength, flexibility, respiratory, and cardiovascular capacity, as well as engagement in physical activity (IPAQ-SF).

Results

Participants scored within age-related ranges on lung function, shoulder range of motion, grip strength, and cardiovascular capacity. Poor results in the plank, press up, and sit and reach were observed. Reported difficulty (22%) and pain (17%) in internal rotation of the right shoulder were found. Differences between instrument groups and level of study were observed in some measures. Brass players showed better lung function and grip strength compared to other instrument groups. Postgraduate students reported higher hypermobility, lower FEV1, and better results in plank time than undergraduates, but poorer cardiovascular fitness. 79% of participants exceeded the recommended weekly limits of physical activity, singers being the most physically active group, and keyboard, composers, and conductors the lowest. IPAQ-SF correlated positively with lung function, sit and reach, press-up, and cardiovascular fitness.

Conclusions

While various indices were within the norm ranges, findings suggest that music students need to strengthen supportive musculature and be aware of strength imbalances in order to meet the physical demands of making music. The differences observed between levels of study may hint towards the effects of longer-term exposure to music practice, performances, and the adaptations that may occur. We suggest that education on anatomy and the physiological impact of specific instruments to be part of music students training but also available for music teachers and other professionals that work with musicians. Screening assessments should also be offered in conservatoires as well as strength and conditioning initiatives as strategies to raise awareness of and support self-monitoring and improvement of one's levels of fitness.

VOCAL HEALTH: AN EVALUATION OF THE BASIC PROTOCOL OF THE EUROPEAN LARYNGOLOGICAL SOCIETY (ELS) FOR TRAINED SINGERS

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Background

The career of a professional singer is highly demanding and physical and psychological signs of these demands can already be noticed during conservatoire training. Due to high numbers of graduates and limited work opportunities for singers, pressure and competition are high. This stress, together with a lack of standardized education about vocal health, can lead to dysfunctional vocal use, physical and psychosomatic conditions, and limited performance abilities. The European Laryngological Society (ELS) developed a functional voice assessment protocol to formalize clinical voice assessments. It includes vocal perception, acoustics, videostroboscopy, aerodynamic parameters, and self-rating by the patient, reflecting different aetiologies of voice disorders, the outcome of treatments, and gender-specific differences. The protocol is suitable for all "common" voice disorders, but not for extreme voice alterations (e.g. spasmodic dysphonia, aphonia, substitution voices). This protocol and the standard values have been developed based on data from the general population; however, its appropriateness for use with professionally trained singers remains unknown.

Aims

Employing the ELS protocol, this study explored its clinical value with professionally trained singers by investigating the following: (1) identify common singer-specific health problems; (2) determine the reliability of phoniatric parameters (e.g. Jitter, Dysphonia severity index, etc.) in professional singers and whether the standard values from the ELS protocol are applicable for this population; (3) examine whether passaggi are detectable in a voice range profile; and (4) explore how vocal parameters change during voice training.

Method

One hundred and thirty undergraduate and postgraduate vocal students underwent a multi-stage vocal screening program including the ELS clinical parameters, vocal technique, individual health, and wellbeing. Of those, 39 underwent the screening programme twice: once in 2014 and again in 2016.

Results

Analysis of data collected is currently underway.

Conclusions

The vocal, physical, and psychological wellbeing of a professional singer are requisite for a long-term career. Due to the complexity of this topic in relation to professional singers it becomes apparent that the ELS protocol is neither adequate to specifically detect the origin of voice disorders nor lead to concrete therapeutic conclusions. The given standard values of the ELS protocol have not been approved for singers and aspects of the vocal training (e.g. vocal technique) are not accounted for in the protocol. The formation of new standard values and the extension of clinical methods by shining light upon singers' lifestyle behaviors, health, and technical vocal aspects may close a gap in knowledge about vocal technique within medical care. This stands to increase the understanding, awareness, and

responsibility of voice clinicians towards professional singers to detect the origin of functional dysphonia and support long-term careers in singing.

Keywords

Acknowledgments

Thursday
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Keynote paper

ENHANCING SPORTS PERFOMANCE: A BIOMECHANICAL APPROACH

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Background

This presentation will encompass a 15-year program of research looking at the biomechanical interaction between the rower and the rowing ergometer and the implications to performance.

Aims

The aim of our work is to understand the implications of human biomechanics on performance and how these can be optimized.

Method

Using an electromagnetic motion analysis system synchronized with a bespoke instrumented rowing ergometer, data on rowing biomechanics has been collected and analyzed in relation to musculoskeletal health and performance in a range of novice, club, and elite rowers. This was combined with studies on muscle function and performance. Data has been modelled using a variety of tools to understand its relevance to performance and injury.

Results

A rowing ergometer has incrementally been instrumented to allow athlete ergometer interactions to be quantified. From this metrics of performance have been identified and defined. The impact of different performance challenges on these metrics including fatigue, intensity, warm-up, and experience have been explored and quantified. In parallel a language for conveying performance across the team including coaches, medical staff, and athletes has evolved, facilitated by real-time biofeedback during the assessment. Associated work on muscle function has complemented our biomechanical findings highlighting issues of extension and flexor relative weakness and sub-standard endurance. This has led to changes in training programs and coaching which have been reflected in improvements in biomechanical parameters of performance.

Conclusions

This work has led to changes in coaching and training practice and the identification of tools to quantify performance. Testing is now a regular aspect of the elite program and early data suggests that on an individual basis such metric may have a role in identifying early signs of injury, thereby offering the potential to implement prevention strategies. This work is on-going and approaches used can be translated to other daily tasks or performance scenarios.

Keywords

motion analysis; biofeedback; instrumentation; coaching; human equipment interactions

Poster session I

VISUAL INFORMATION FOR EFFICIENT SCORE READING BY PIANISTS

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Background

When sight-reading music, pianists have to decode a large number of notes and immediately transform them into finger actions. How do they achieve such fast decoding? Pianists may use geometric features contained in the musical score, such as distance between notes, to improve their efficiency in reading them.

Aims

The aim of this study is to investigate the types of visual information pianists rely on reading music.

Method

Six professional pianists participated in the experiment. All had graduated from musical programs at universities with a degree in piano performance. The experimental task was to answer the target notes presented on a display (EIZO, FORIS FS2434) by pressing the corresponding keys on the hybrid piano (YAMAHA, AvantGrand N2). The target notes were of two types: a single note and an octave interval, and their height ranged from C3 flat to B7 sharp on the G-clef, and from A0 to C5 sharp on the F-clef. The target notes had the note value of a quarter note and were written in a one-measure length great staff. The measure was a four-four time and the target notes were presented for 300ms as quarter notes at the second beat position of a four-four time measure. Participants were asked to play the target notes at the 4th beat timing, according to the metronome (BPM 60). We examined how exactly each participant played the target notes. Every target note was presented once to prevent participants from memorizing them during the experiment. The total number of the target notes was 177 on the G-clef and 163 on the F-clef.

Results

On the G-clef, the participants responded almost perfectly for the range from F3 sharp to E6 flat for single notes, and from C3 flat to B7 sharp for octave intervals. On the F-clef, the range of perfect responses was from C2 sharp to A4 for single notes, and from E1 to C5 for octave intervals. These results indicate that pianists can read octave intervals more easily than single notes, even though the octave interval consists of two notes. Such findings suggest that pianists can automatically recognize the visual pattern of an octave interval and estimate its key positions based on the note closer to the staff. In other words, pianists may locate musical notes making use of the positional relationship between multiple notes—both in tone height (i.e. vertical on the score) and tone sequence (i.e. horizontal)—rather than by the absolute position of each note.

Conclusions

These results illustrate that pianists rely on geometric information in musical scores for efficient reading of music. Future research could be conducted to determine if and how other visual clues, such as chord type and temporal structure, help pianists sight-read more efficiently.

Keywords

sight-reading; score reading; piano performance; visual information processing; geometrical feature

Acknowledgments

CONSERVATOIRES UK HEALTHY CONSERVATOIRES NETWORK

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Background

The Okanagan Charter for Health Promoting Universities and Colleges established a call to action based on the World Health Organization acknowledgement that health promotion activity needs to be specifically adapted to the settings in which it is delivered. Advocating that "Health is created and lived by people within the settings of their everyday life; where they learn, work, play, and love," this guidance encourages tertiary education centers to embed health into all aspects of their culture; across administration, operations, and academic mandates, ensuring that institutions lead health promotion action.

Representing some of the most prestigious performing arts education institutions in the world, Conservatoires UK (CUK) acknowledged this international call, and recognized the need for specialized structures which support the health and wellbeing of performing artists. The CUK Healthy Conservatories Network (HCN) was created to explore the role of health and wellbeing for performing artists and discuss how the needs of students and staff in the conservatoire setting might be better met with collaboration across an entire sector.

Aims

The Healthy Conservatoires Network aims to inspire and support environments that promote and enhance the health and wellbeing of performing artists, in order for performers to achieve their full potential and to build healthy, sustainable careers. In particular, the network provides a space in which members can come together to receive news and updates on identified priority health needs of performing artists; communicate and discuss "hot topics" between conservatoires and access to peer support; share good practice; engage with research, innovation, and evidence-informed action; and find guidance in creating and maintaining a healthy conservatoire.

Main contribution

The HCN is made up of representatives from the eleven institutions of Conservatoires UK, plus observer members from other higher education institutions, the professional performing arts sector, unions, and supporting charities (N=80). The network meets twice a year to bring together best practice from the wider fields of health promotion and higher education student support, tailoring it for the particular constraints of working, teaching, and learning in the performing arts.

This poster will offer further insight into the underpinning theoretical principles employed to create the network, and the frameworks and tools that have been created to date. It will also highlight the innovation and further research that has been demanded by HCN members and explore the challenges of creating a collaborative environment within a highly competitive sector.

Implications

The HCN echoes a widespread demand for cultural change which supports healthier lifestyles. Bringing this agenda directly to the performing arts sector, the network has grown significantly in its short existence demonstrating a clear enthusiasm and need for collaboration in developing specialist health and wellbeing provisions across conservatoires. The future development of the HCN is currently being discussed, taking into consideration both the network's potential for impact and need for sustainability.

Keywords

health; wellbeing; performing arts; careers; network

Acknowledgments

A QUALITATIVE INVESTIGATION INTO THE IMPACT OF MIRRORS ON DANCERS' PERCEPTIONS OF MOTIVATIONAL CLIMATE IN A CONTEMPORARY DANCE LEARNING ENVIRONMENT

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Background

Little is known about how physical features of the dance environment potentially contribute to motivational climate creation. Quantitative research has examined the impact of inter-personal factors upon dancers' perceptions of motivational climate, in particular, demonstrating the pivotal role of the dance teacher. In dance, mirrors may encourage comparison of self with other students or peers. In turn, this may enhance external references of achievement, an element shared with an ego-involving climate. This is defined as an environment where individuals are encouraged to outperform others, with an emphasis on success over failure, as opposed to self-growth. Research has demonstrated that dance teachers may be one of the most influential factors in the creation of motivational climate. Qualitative research indicates that dance educators often use the studio mirror as a pedagogical tool, yet the ways in which this is used to enhance self or other reference is unclear. It could therefore be suggested that if teachers' mirror use promotes ego-involving attributes, there may be an effect on motivational climate perceptions.

Aims

The primary aim of the current study was to examine the potential impact of learning in a mirrored studio on perceptions of the motivational climate. A secondary aim was to understand the teacher's use of the mirror, and the further impact of this on the students' perceptions of the motivational climate.

Method

The study employed a qualitative methodology. Semi-structured interviews were carried out by the first author to obtain rich perceptions of both motivational climate and teacher's mirror use. Four students (2M, 2F) undertaking their first year of full contemporary dance training participated in the interviews, as well as their contemporary technique teacher. The teacher's interview differed slightly in questions.

Inductive thematic coding was used to extract themes and subthemes between and within participants, resulting in the emergence of a hierarchy of themes.

Results

Thematic analysis of the five interviews revealed four main themes which provided insight into mirror use and factors which influence motivational climate perceptions; *mirror use*, *motivation*, *motivational climate*, and *teaching*. The main themes were also found to consist of sub-themes, which indicated that although positive and negative beliefs were held regarding mirror use it was not seen as an influencing factor in relation to motivational climate.

Conclusions

The qualitative findings provide further insight into perceptions of mirror use in a dance setting in relation to bodily awareness and its impact on sensory awareness. Other potential factors influencing motivational climate, largely student peers' motivation levels that have not previously been investigated, emerged from the interview analysis. Implications of the research findings include greater knowledge for teachers in how a motivational climate is created, and how to utilize the mirror to create the most adaptive pedagogical climate for students, which simultaneously promotes motivation and psychological well-being.

Keywords

motivation; motivational climate; mirrors; contemporary dance students; qualitative

DOBLES DEL PARAMO: PHOTOGRAPHY, WORDS, AND MUSIC

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Background

Dobles del Páramo, a piano solo piece composed in 2006, was commissioned by the pianist Ana Cervantes as a part of Rumor de Páramo (Murmurs from the Wasteland) an international commissioning and recording project in homage to the Mexican writer Juan. The project initially had 18 invited composers representing three generations of musical creation. The second cycle of commissions comprises the 11 works recorded in volume 2 Solo Rumores (Solo Murmurs), and released on 29 November 2007, in concert in the CENART (National Center for the Arts) in Mexico City. *Dobles del Páramo* is the only work representing South America and Brazil.

Aims

In addition to Juan Rulfo's writings were some of the beautiful photographs taken by Rulfo, also a well regarded photographer. The first image I saw was the one whose intensity caused an immediate impression of a sonic correspondence just because of its imagery, later confirmed by noting the structure of Juan Rulfo's writing: for whom and to whom would these bells have rung? The decision to use it as a structural source was confirmed as the reading of the literary work of Rulfo was quickly being realized. *Dobles del Páramo* depicts a universe where time is not linear, and just like the structure of the works of Juan Rulfo, it contains several structural layers, as a parallel to the layers of history and times that coexist as parallel realities in the artistic universe of Rulfo. The main objective in composing this piece was to evoke structurally non-linear time and spaces.

Main contribution

The echo and the constant repetitions are dominant motifs, as though to emphasize insecurity, yet at the same time re-emphasize the predetermined. In the architecture of this universe, the echo reconnects seemingly diverse structures, but also disperses them. *Dobles del Páramo* was composed with highly concentrated material. The use of resonance elements adds a new layer to the melodic and harmonic tissue which can only be heard, while playing, and is exclusively due to interpreter's ability to extract the melodies and harmonies included, but hidden in the structure of the piece through the use of pedals and observing the durations and intensities indicated—and of which the notation, however accurate it may be, is only a projection of what "could be made sound"—the quality of the instrument used in the execution, the acoustics of the place of performance, which thus may or may not release harmonics, and not least, the number of people present during the execution will all affect the final performance result.

Implications

The melodies and hidden harmonies formed by harmonic spectra, whose unpredictability is expected in the work structure is due to a number of uncontrollable a priori elements, so it can provide another layer to reinforce the structures found in Rulfo: the echo and the constant repetition, become dominant motives, as well as the repetitions, like how to ensure unsafe, and at the same time reassure the predetermined.

Keywords

Dobles del Páramo; Rulfo; piano solo; photography; words

Acknowledgments

ANALYSING THE CONTENT OF CONCERT PROGRAM NOTES WRITTEN BY STUDENTS, COMPOSERS, AND PROFESSIONAL WRITERS FOR CONTEMPORARY CLASSICAL MUSIC

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Background

Concert program notes for works in the classical canon typically contain dramatic and/or structural information, and program notes from the 19th century can also include writers' personal opinions of the pieces about which they write. Recent research has investigated contemporary classical composers' written notes for their own works and has incorporated Ferrara's analytical listening framework of syntactical, semantic and ontological meanings to understand composers' intentions.

Aims

With a focus on contemporary classical works in the Australian context written by students, composers, and professional program note writers, this study utilized all six of these informational categories to create and trial an analytical frame for analysing program note content.

Method

An analytical frame was created using the six informational categories investigated in our previous research, namely: ontological, dramatic, semantic, personal, structural, and syntactical. Ten program notes from each writer cohort were analyzed. The program notes focused on contemporary classical works in the Australian context–that is, notes written about Australian contemporary classical works or program notes written by Australian students, Australian composers and Australian professional program note writers. The methodology drew on the work of Stanley when analysing and discussing documents of life. Here, program notes are viewed as texts which are the product of interpretation and claim in musical life: motivated, that is, produced for a purpose, and as accounts. A word count was made to determine emphasis of information type. Drawing on Dampier's three methodological practices when analysing historical letters, we each made a close reading and re-reading of the program notes, situated the program note content in relation to the analytical frame. Adopting an inter-coder reliability approach, we then compared our analyses for consideration and comment in order to reach consensus.

Results

Content analysis revealed overlap of the six information categories within the analytical frame, notably between semantic and dramatic content, and syntactical and dramatic content. The writing of all three cohorts engaged strongly with ontological information, giving information about influences from the arts and elsewhere. Program notes written by composers had the highest percentage of semantic content, students relied most heavily on ontological information, and notes written by professional program note writers had the highest percentage of syntactical content, often moving between two content modes in one sentence. No personal comments regarding a writer's like or dislike of a piece were encountered; however, both student and established composers used first person to describe their aesthetic reasoning. Some composers also included comments about intimate events related to the writing of the piece. The use of structural and syntactical information was more common among composers and professional writers.

Conclusions

Program notes contain a range of information that can influence and guide listeners through semantic and dramatic description, structural and syntactical knowledge, and contextual (ontological) information. Analysis reveals that the program note is not a benign piece of writing but a documentation or narrative of a musical work and the life from which it came. This is of particular importance when the work is contemporary and the composer's voice is heard.

Keywords

program note; contemporary classical music; analytical frame; program note writers; documents of life

MAIN AND SUBJACENT DISCOURSES IN THE COLORATURA GESTURES OF CECILIA BARTOLI AND KIMCHILIA BARTOLI

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Background

A significant part of the music performance discourse remains in the realm resulting from the amalgamation among text, sound, and images. If the text (or context) that inspires the composer is key for the performer to interpret music, the performer's body language may express his/her own subtexts that surpasses the main discourse, especially the one communicated by facial expressions. The analysis of music videos may reveal the double discourse implied in those situations.

Aims

Departing from performances of the same work, namely the aria "Agitata da due Venti" (1735) by Antonio Vivaldi and Carlo Goldoni, recorded in video by two referential singers (Cecilia Bartoli, 2008 and 2009; Kimchilia Bartoli, 2011 and 2015), I show how a performer communicates a double discourse simultaneously based on the primary source (the score) plus the addition of her/his own contrasting intentions (the performance) as an adjacent subliminal interpretive source.

Method

Analysis of music videos based on the recognition of body movement aspects, affects, facial expressions, stage kinesfera, props, scenery, and lighting; to finally construct MaPAs (Audiovisual Performance Maps) and EdiPAs (Audiovisual Performance Editions) as proposed by Borém in 2016 and 2015.

Results

Both coloratura singers add a second contrasting layer of meanings to the original music score. If Cecilia Bartoli superimposes an "expectation-challenge-victory" imagetic discourse over Vivaldi-Goldoni's "fear-sadness-fear" scheme (reflecting the ABA aria form), countertenor Kimchilia Bartoli (Kangmim Justin Kim's alter ego) adds his/her own display of various coloratura skills over his parodic gestures of Cecilia Bartoli and other opera diva stereotypes.

Conclusions

In the construction of music performance, interpreters such as Cecilia Bartoli and Kimchilia Bartoli (Kangmim Justin Kim's alter ego) may superimpose a subjacent subliminal discourse on the main discourse, communicating simultaneously a double layer of contrasting meanings.

Keywords

analysis of music videos; text-sound-image trinomial; coloratura performance practices; vocal virtuosity in opera; Cecilia Bartoli and Kimchilia Bartoli

Acknowledgments

WORDS INSPIRE MUSIC: A COMMISSIONING PROJECT CELEBRATING JUAN RULFO

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Background

Words have always been a fertile inspiration for music; and rarely more so than in Rumor de Páramo (Murmurs from the Wasteland), a commissioning and recording project which pianist Ana Cervantes completed in 2006-2007. The project is an homage to the landmark Mexican author and photographer Juan Rulfo (1917-1987), of whom Gabriel García Márquez said that without Rulfo's *Pedro Páramo*—arguably both a long narrative poem and a short novel— his own *100 Years of Solitude* would never have been possible. Rumor generated 23 new pieces for piano solo, ranging from four to 11 minutes in duration, from composers of five countries: Mexico, Spain, Brazil, Great Britain, and the USA.

Aims

Commissions continue to be a principal motor for the creation of new music. However, they come mostly from chamber groups, e.g. string quartets; and institutions, such as dance companies or orchestras. It is unusual for solo performers to undertake such projects. One aim of this presentation is to encourage other interpreters to undertake the commissioning of new works, giving them an idea of what they might expect. Another is to highlight how this particular relationship with new music may inform our relationship with the repertoire.

Main contribution

This presentation will describe the process of the commissioning project, covering, among other details, the various relations with composers; funding (the project had the support of four governments and numerous private individuals); multi- and inter-disciplinary aspects; and the unexpected second child of the project, the Solo Rumores (Solo Rumours) disc.

Implications

Although the pieces specially composed for the Rumor project were inspired by the creation of Juan Rulfo, some of these works have a life of their own outside the project, thus transcending its initial proposal.

In many music schools new music still occupies one space and the "standard" repertoire another. While it is primordial to include and appreciate all the splendid diversity of musical creation it is equally important to establish lines of connection rather than frontiers of separation. What if all student interpreters were to commission music? They need not be projects of many pieces: one each for the Junior and Senior recitals could suffice. And the fee might be an agreed-upon number of performances, or of good home-cooked meals. The point is to establish those lines of communication between interpreter and creator and make them part of the young musician's formation, be she interpreter or composer.

Keywords

commissioned music; Juan Rulfo; piano; Solo Rumores; Rumor de Páramo

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PAIN ANALYSIS IN MUSICIANS USING DIGITAL PAIN DRAWINGS

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Background

According to the existing literature, both professional musicians and advanced music students are at risk to develop performance-related musculoskeletal disorders (PRMDs). PRMDs among musicians have been mainly investigated and assessed in terms of pain prevalence and pain intensity by means of questionnaires and physical tests. Recently, a digital technology to record pain location and pain extent has been developed.

Aims

The aim of the study was to describe pain location and pain extent in musicians with PRMDs using a digital method for pain drawing analysis. Additionally, the association between Pain Drawing (PD) variables and clinical features in musicians with PRMDs was explored.

Method

One hundred fifty-eight musicians (90 women and 68 men; age 22.4±3.6 years) were recruited from the Conservatory of Southern Switzerland, the Royal College of Music, the Royal Conservatoire of Scotland, the Royal Central School of Speech and Drama, the Royal Welsh College of Music and Drama, and the Southbank Sinfonia. Participants were asked to complete a survey including background musical information and clinical features, the Quick Dash (QD) questionnaire, and the digital PDs.

Results

Of the 158 musicians participating, 126 participants (79.7%) reported having pain in at least one of the Margolis anatomical region, with more prevalence in the area of the neck and shoulders, and in the area of the low back and the right arm. Only 32 people (20.3%) reported having no pain. The mean of pain extent was 3.1%±6.5. The mean of QD was larger for musicians showing the presence of pain in at least one Margolis anatomical region, than for musicians without pain. Additionally, the results indicated a positive correlation between QD and pain extent. Moreover, there were significant correlations between age and pain intensity, as well as between pain extent and pain intensity.

Conclusions

The high prevalence of PRMDs among musicians has been confirmed using a digital PD. In addition, positive correlation between pain extent and upper limb disability has been demonstrated. Our findings highlight the need for effective prevention and treatment strategies for musicians.

Keywords

performance-related musculoskeletal disorders; pain location; pain extent; pain drawings; digital technology

SINGER'S HEALTH: SIDE EFFECTS OF MEDICINES AS REPORTED BY VOICE STUDENTS VERSUS THOSE DESCRIBED IN THE LITERATURE

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Background

Health maintenance is an essential issue to voice students since their bodies are their instruments. A slight alteration in this instrument can compromise the vocal performance. Many singers often choose drug therapy as a shortcut to avoid or treat undesirable symptoms such as cough, nasal discharge, anxiety, and pain. However, different types of medicines can affect the vocal chords, muscles from the vocal apparatus, body balance, attention, memory, and emotional state. The rational use of medication can contribute positively to the vocal performance.

Aims

To identify the most common medicines used by voice and choir students from Department of Music from the Faculty of Philosophy, Sciences and Literature of Ribeirão Preto (FFCLRP), and compare the side effects reported by the students to those reported in the literature.

Method

A questionnaire containing ten questions about the consumption of medicines was elaborated and approved by the Research Ethics Committee from FFCLRP. The questionnaire was applied to 71 voice and choir students of the Department of Music. The obtained data were processed in an Excel spreadsheet (Microsoft Office, 2007) for quantitative and qualitative analysis. The results were compared to the data in the literature using scientific databases.

Results

The most common medicines used by the voice students were: anti-inflammatories (79% of the participants), analgesics (69%), reflux and gastritis medications (66%), nasal decongestants (63%), antiallergic medications (58%), and antibiotics (58%). A total of 54% of the participants using anti-inflammatories reported sleep disturbances as the most common side effect. The voice students related analgesics such as paracetamol to sedation and dipyrone to oropharyngeal dryness. Omeprazole was the most used medicine to treat reflux and gastritis. A total of 30% of the participants related its use to the improvement of the vocal performance although 40% of the students reported se-

dation and voice changes as side effects. A total of 67% of the participants using antihistamines reported sedation as a side effect. For the decongestants, the mucosal dryness was the most significative side effect reported by 33% of the voice students. In the other hand, 55% of the participants related the use of decongestants to vocal improvement. A total of 31% of the students reported oropharyngeal dryness as the main side effect of antibiotics intake.

Conclusions

The majority of the medications used by the voice students from FFCLRP can affect the vocal performance according to the described side effects in the literature. In many cases, the side effects reported subjectively by the voice students were different from those described in the scientific studies. This may reflect the difficult association of the side effects with the medication and the different responses according to each individual organism. This study highlights the importance of the rational use of medicines by voice students and professional singers.

Keywords

voice; medicines; side effect; singer's health; vocal performance

Acknowledgments

MUSICIANS' AUDITORY DISCRIMINATION SKILLS WITHIN AUTHENTIC MUSIC CONTEXTS

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Background

The development of music performance skills requires not only the refinement of perception and motor behavior but also the ongoing assessment of one's own playing. To achieve this, learners must have clear short-term performance goals, experience attempts to accomplish these goals, perceive the discrepancies between the results of their attempts and their intended outcomes, and adjust their behavior to reconcile those discrepancies. Although researchers have examined many aspects of the development of performance skills (i.e. music practice), little is understood about the development of musicians' auditory discrimination skills within authentic music contexts, and how these discriminations guide decision-making during music practice.

Aims

Testing our conjecture that changes in auditory discrimination coincide with increasing levels of music performance skill requires an effective measure of auditory discrimination of musically plausible differences between various renditions of music excerpts. We sought to develop a valid, reliable measure of musical discrimination, one that assesses musicians' ability to detect small differences in pitch, loudness, and duration within musical contexts.

Method

We developed test items from recordings by Hilary Hahn (violin) and Yo-Yo Ma (cello) performing unaccompanied works by J. S. Bach. We used Melodyne Assistant 4 to create modified versions of the brief excerpts of cadence points, altering *either* the timing, loudness, or pitch/intonation of one or more tones within each excerpt. All of the alterations were small (e.g. ±30 cents in pitch) and within the range of possibility for an actual performance.

We examined multiple iterations of the test items with undergraduate music majors, graduate music majors, and professional musicians, all of whom were string players, to determine difficulty and discrimination indices for each item.

Results

We have identified a bank of test items that effectively discriminate among listeners, and we are in the process of validating the test bank with other measures of performance skill (concurrent validity). We obtained test-item discrimination indices ranging from 0.24 to 0.65, and musicians' skill levels were positively related to their overall discrimination scores. This is the first example of testing discrimination abilities in contextualized music performances.

Conclusions

The data we have analysed to date (further data collection is ongoing) indicate that the test may serve as a valid measure of refined auditory discrimination in musical contexts. The design of the test does not lend itself to determining precise difference thresholds in isolated dimensions of sound, but provides for the assessment of musicians' discrimination abilities regarding the types of variations that typically occur in the practice and performance of music.

Keywords

error; expertise; discrimination; musicians

AUGMENTED EMBODIMENT: A PERFORMANCE WORKSHOP FOR STROKE SURVIVORS

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Background

This paper describes a performance workshop approach to stimulating embodied enactment of fantasy worlds by stroke survivors. Performance techniques are combined with live motion-capture to provide people with an abstract visual world that helps them to represent and share fantasy scenes they create.

With the collaboration of the company Split Britches we designed a new version of their "Green Screening Workshop" process using interactive digital scenography. These workshops create an environment, performance format, and supporting scenographic tools that help stroke survivors envisage and enact imaginative fantasies of "things they'd always wanted to do."

We focus in particular on the use of motion capture to provide workshop participants with real-time visualizations of their own body movements. The visualizations are designed to provide a simple and largely invisible interface to the motion capture technology, to evolve through three different visual forms that represent body movements in different ways, and to promote engagement with the co-present audience.

Aims

The main objective was to enhance the interactive, embodied elements of people's performance of their fantasies and to enhance the shared experience of the workshop. The aims were to: (1) Promote embodied enactment of stroke survivors' fantasy worlds. (2) Explore the value of "abstract" representations of body movements in encouraging imaginative exploration. (3) Support group interaction, which includes audience members as participants. (4) Provide a practical, mobile system that can be easily deployed in the performance therapy community.

Method

Our methodology involved the filming of both workshops, a follow-up group session with an independent assessor to gather qualitative data about their experience, and a written questionnaire to the Group Coordinators.

Results

Qualitative analysis suggests that our performance-based approach succeeds in promoting high levels of movement and active embodiment of fantasies. The narrative process and visualisations stimulated a much richer repertoire of improvised movements than is typical in other therapeutic contexts and participants engaged enthusiastically as performers and audience. The shared experience of performing was cited as a critical part of the process.

Conclusions

A performance-based approach to expressive movement enhanced by interactive motion capture in a shared visual scene has significant potential for helping stroke survivors. Interactive, embodied performance plays a critical role in the effectiveness of this process. Participants found it physically and mentally engaging and exploited it to enact fantasy scenes of new possible worlds for their lives after a stroke.

Keywords

embodiment; expressive therapy; motion capture; stroke survivors

THEORETICAL FRAMEWORK FOR A 3D TESSITUROGRAM AND 3D VOICE RANGE PROFILE FOR USE IN ASSIGNING REPERTOIRE

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Background

Assigning vocal repertoire is a difficult task, often because the tessitura of a piece may cause students vocal stress, not to mention emotional stress. Rosenthal and colleagues have linked vocal stress to changes in aerodynamic factors such as subglottal pressure and transglottal airflow. Therefore, it would be useful to have a way to quantify both the vocal stress indicated by the repertoire, and the potential of the student to handle that stress. The two most logical ways to do this would be to use a tessiturogram to determine the vocal stress of repertoire and a voice range profile or phonetogram to determine a student's ability to handle that stress.

Quantifying the tessitura of a piece is challenging. Rastall proposed what he calls the "Pitch Center of Gravity," derived from mechanics, as a way to quantify tessitura. Thurmer suggested counting the occurrence of the pitches in the vocal part, and creating a graph called a tessiturogram. Titze proposes calculating the Cycle Dose, an indication of vocal stress defined as the product of frequency and duration (in seconds) of the sung tone, and comparing it to the Voice Range Profile as a method of assigning repertoire. A Voice Range Profile, which measures the intensity range of a singer on a given pitch throughout their vocal range, is a good measure of vocal stress potential. The author tested Titze's suggestion, and found that it did serve as a good measure. The issue, however, was that a typical tessiturogram accounts for pitch and duration, but not intensity. Intensity in singing is controlled by subglottal pressure, an aerodynamic factor identified by Rosenthal and colleagues as an indicator of vocal stress. Furthermore, a typical voice range profile records only pitch and intensity, but not duration. Duration is largely a concern for singers because of the amount of airflow required to sing a note given its pitch or position in the phrase. Airflow is also another factor identified by Rosenthal and colleagues.

Aims

To provide a more complete assessment of the vocal stress required in a piece of vocal music, and a more complete assessment of a student's vocal stress potential, it is necessary to develop a three-dimensional tessiturogram and a three-dimensional voice range profile.

Main contribution

This paper will discuss a theoretical framework for the development of three-dimensional tessiturograms and voice range profiles utilizing MIR technology and machine learning.

Implications

The implications for this framework are major. If a searchable database were created where singing teachers and students could simply upload a voice range profile and choose the other criteria they desire, e.g. language, musical difficulty, emotional composer, range, a tessiturogram, etc., then the database would return repertoire that not only matched their criteria, but that matched the students vocal ability as well. Voice teachers would no longer need to have extensive knowledge of a student's voice prior to assigning repertoire, rather just a few minutes to create the voice range profile.

Keywords

voice range profile; singing; repertoire; MIR; tessitura

THE MUSICAL CANON AS A REGULATIVE FACTOR IN ORCHESTRAL PERFORMANCE PRACTICES

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Background

Recently, the attention of many scholars in the field of music aesthetics is drawn to the musical canon as a decisive factor in shaping orchestral performance practice. In her renowned essay *The Imaginary Museum of Musical Works*, Lydia Goehr considers the regulative nature of the concept of the musical work and of the canonized repertoire as a whole, for a musical canon is not only created by artistic practice, it also performs a normative function by regulating that same practice. In a similar vein, William Weber considers musical canonization an effectual process, implicitly affecting not only aesthetic parameters, but also permanently influencing and affirming performance practices within their cultural and social contexts.

Aims

Drawing inspiration from these theoretical models, this paper aims to understand the complex relation between the canon and orchestral performance practices. Rather than as a fixed entity exerting authority, however, the canon is conceptualized as a constantly evolving process that is (1) defined by aesthetic ideals as well as by seemingly contingent contextual factors (social, financial, political, pragmatic, etc.); while (2) it simultaneously defines and steers these same aesthetic ideals and contextual factors. By asserting this circular and self-affirming relation between the canon and its various determinants, this paper wants to investigate to what extent recent tendencies in orchestral performance practice can be ascribed to this web of intricate relations.

Main contribution

In this paper, I develop and explore the hypothesis that the constant reassertion of the canon's untouchable status has dire consequences for the orchestral landscape today. That is to say, due to its aesthetic as well as its contextual determinants, the musical canon has grown unreceptive to new fertilization. Precisely on the account of the unquestionable authority of its monolithic content, I argue that the canon slowly tends to stagnate both the development of aesthetic parameters and of performance practices.

Implications

In order to get a clearer view on the various factors that contribute to the authority of the musical canon and in turn reaffirm its rigidifying status, empirical study of actual orchestral performance practices is needed. This paper is a first theoretical exploration of a number of complex causal relations that need to be further investigated by field research of that kind. To this end, I have carried out a preliminary empirical field study in Amsterdam to concretize my hypothesis.

Keywords

aesthetics; music; canonization; performance; orchestra

FORCE FIELD BASED CHOREOGRAPHY: DIGITAL DANCE WITH COMPUTER SIMULATION

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Background

"Impermanence" is a multidisciplinary performance presented by digital artist Chi-Min Hsieh, choreographer Shiu-Lien Wu, dance producer Yu-Ling Du, and their team from Taiwan. The work is a combination of dance, interactive techniques, and visual arts, which integrates powerful body languages and skillfully designed group dances. It explores the "permanence" and "impermanence" of life through the observation of flow phenomena in the nature as well as intricately changing interpersonal relationships.

Aims

In the artwork, we address the concept "force field" aiming at the influence between body and the surrounding environment. For the purpose of sensing dynamical process of interplay between body and the surrounding, we propose using computer simulation to reveal intensity of dance instead of its apparent movement. The selected algorithms,

fluids, and flocking simulation are implemented not only for visual appearance, but also because of aesthetic correspondence related to choreography.

Method

We use an infrared camera to observe body temperature and then transform temperature information into an imaginary velocity field. The temperature-related velocity field represents how we view the relationship between the body and the surrounding environment. Based on velocity field, flow phenomena are simulated according to Jos Stam's algorithm, which is fast, looks convincing, and is easy to code. Moreover, social group dances related to emotive expression are much more complicated. We use flocking simulation according to Craig Reynold's algorithm, emulating complex collective motion with simple and elegant rules: separation, alignment, and cohesion.

Results

Laban's effort-shape theory categorized the relationship between qualities and movement into four elements: weight, space, flow, and time. In reference to Laban's effort-shape, our fluids simulation creates various modes of force field as significant comparison. For example, sudden/sustained factor is referred to the speed of flow; bound/free factor is referred to the degree of vorticity; direct/indirect factor is referred to the degree of divergence; light/strong factor is referred to the degree of density. Several significant results are selected to stress interpersonal relationships by flocking simulation, various flow phenomena by fluids simulation, and temperature-related force field by infrared camera.

Conclusions

Through the combination of internal force and external force fields, we aim to interpret complex collective behaviors and to emulate interpersonal relationships such as dependence, lingering, competing, betraying, or vacillating, etc. In the future, we expect to refine a set of simple rules for generating virtual choreography. It provides a new way to make dance focusing on the influence of force field. Notating simple and elegant rules with help of computer simulation makes intrinsic quality and emotive expression perceptible. It is a convincingly well-suited direction for inventing dance notation in terms of effort-force.

Keywords

fluid simulation; flocking behavior; infrared camera; force field

Acknowledgements

STUDENTS' WORKLOAD AS AN EQUITY FACTOR IN HIGHER MUSIC EDUCATION

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Background

Research in higher music education (church music, classical music performance, composition and music theory, conducting, folk music, global music, jazz music, music education, and music technology) indicates that music students may face unique sources of stress, including performance anxiety, perfectionism, career concerns, and lack of respect. Music-induced pain and other health issues are also common in studying music. A reasonable workload and perceptions of effective teaching connected to experiential learning are preconditions for efficient and healthy studying and learning, although there are differences in how workloads are experienced. When taking into account students' well-being in the music university, it is relevant to research workload as it is connected to equity, and the findings may have practical implications for teaching and learning in higher music education.

Aims

By establishing "workload in music university learning as an equity factor," this paper aims at: (1) clarifying among researchers and scholars the notion of "workload in learning," and (2) encouraging researchers and teachers to critically examine workload in music university learning, and its connection to equity in higher music education.

Main contribution

An extensive review of the higher music education literature concerning the meanings and assumptions of the concept "workload in learning" and its implications for equity in higher music education.

Implications

A survey of recent and earlier debates on "workload in learning" among scholars and researchers in higher music education reveals a variety of definitions for the concept of workload, and what it involves in terms of music university learning. The definition of workload is used by many researchers in higher education, but not so often specifically in higher music education. There are only a few references in which workload in learning is connected to equity. This paper provides a theoretical framework for this perspective, and suggests different ways in which workload in learning could be treated and empirically measured in conservatories and music universities. This kind of research can also be utilized in enhancing pedagogical practices, and research in the development of equity in teaching and learning in higher music education.

Keywords

equity; higher music education; music university learning; teaching development; workload

Acknowledgments

HOW DO MUSIC CONSERVATOIRE KEYBOARD STUDENTS ACQUIRE THE TECHNIQUES AND STRATEGIES THAT ENABLE THEM TO READ MUSIC AT SIGHT?

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Background

The ability to play music at sight or sight read is an essential skill for professional musicians and conservatoire students, and highly sought after by many others. Despite this, conservatoire student participants reported feeling anxious at having to sight read as a result of insufficient training. The majority of the sight reading (SR) literature uses eye tracking to identify where on the score a performer's eyes look, often comparing novice and expert performers. This study sought to explore and contribute in a more direct way to pedagogical advancement.

Aims

This study sought to investigate, through interview, how conservatoire keyboardists learned to read at sight both at conservatoire level and in their previous training.

Method

Semi-structured interviews were used to explore student experiences of SR. The study's participants were welcomed from a wide range of training and cultural backgrounds, and eight different countries (10 including participants in the pilot study). Questions examined to what extent the skill of SR was taught, how much students had to perform at sight, and how prepared they felt to perform. Interviews were recorded to ensure accuracy and the transcripts thematically coded.

Results

Participants from eight different countries and backgrounds were unanimous in reporting a lack of structured or effective SR training both during their conservatoire training and before. Participants expressed a desire for more structured training on how to develop SR skills. Having to SR was reported as a cause of anxiety. Confidence level in the skill was directly linked to an individual's ability to SR. Participants who demonstrated the most confidence in SR had received or devised extra-curricular methods to develop the skill. These included: accompanying at sight; performing duo or ensemble playing under a reasonable amount of pressure generated through an exam requirement; peer pressure (wanting to perform well); and the musical requirement of supporting a singer or other player in ensemble performance. In addition, students reported that their SR improved by integrating musical knowledge across modalities, applying musical knowledge, and experience in score analysis. These themes inspired the creation of a Longitudinal Training Model (LTM). The model adopts a spiral learning approach whereby techniques are revisited in increasing depth over time. Student and teacher duo playing, rhythm training, and increasingly detailed pre-performance score analysis are adopted as the principal techniques for improving SR, as reported by participants. A longitudinal study is needed to assess the efficacy of the LTM.

Keywords

Acknowledgments

EFFECTS OF DAILY COMMUNICATION SKILLS ON EMOTIONAL EXPRESSIONS OF PERFORMERS

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Background

Previous studies have suggested that there is an association between the daily communication skills of performers and their ensemble performance. When their daily communications skills are higher, their ensemble performance evaluations are also better. However, it remains unclear whether this pattern is actually related to the acoustical characteristics of their performances.

Aims

This study aimed to examine the relationship between the characteristics of performed sounds of a musical piece with different intended emotional expressions and their daily communication skills.

Method

Six skilled female pianists participated in this experiment (M_{age}=38.7). They played a short piece consisting of 11 bars. A professional composer created the piece for this study, considering the need to avoid implanting a specific emotional impression into the piece. The experiment was conducted in a quiet room of the Nagoya Institute of Technology using an electronic piano (Yamaha, Clavinova CLP-535). The performances were recorded as MIDI data. Participants were allowed to practice the piece until they were satisfied. The participants played the piece intending six types of emotional expressions, namely; happiness, sadness, fear, anger, tenderness, and no emotion at all. The order of the performance of emotional expressions was randomized. Participants were instructed to play while imagining that listeners could determine each type of intended emotion. They were allowed to change tempo, timing expression, and dynamics; however, they were required to keep in pitch, follow the score, and repeat playing their rendition of each emotional expression until they were satisfied with their performance. After the performances were completed, the participants responded to questionnaires, including the Japanese version of the Affective Communication Test (ACT, a scale for daily nonverbal expressiveness) and questions about attributions.

Results

The relationship between the performances and the ratings of ACT indicate that there is a positive correlation between ratings of ACT and the average duration of the emotional expression. There existed a positive correlation between ACT and the standard deviation of the velocity of MIDI data in the expressions of sadness, anger, and tenderness. There also existed a positive correlation between the ratings of ACT and standard deviations for the equivalent of an 8th note duration in the expressions of sadness and fear. In addition, participants whose ACT ratings were high showed significant differences when performing the expressions of sadness and tenderness for the duration of the whole performance. These two types of emotions were observed to be difficult for listeners to determine while listening to the same musical piece being played with different emotional expressions.

Conclusions

The main findings of this study were: (1) that performers with higher communication skills were more significantly able to alter the piece for its entire duration and volume; (2) that this tendency differed depending on the types of intended emotional expressions being played; and (3) that the performers with higher ratings of ACT yielded more significant differences between the intended emotional expressions that were supposed to be ambiguous for listeners.

Keywords

communication skills; emotion; musical communication; piano performance; MIDI

EARLY MALADAPTIVE SCHEMAS ASSOCIATED WITH PERFORMANCE ANXIETY AETIOLOGY AND PHENOMENOLOGY IN CLASSICALLY-TRAINED MUSICIANS

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Background

Excessive performance anxiety can have a marked negative affect on the development and delivery of music performance. Whilst the theoretical and treatment literature around music performance anxiety (MPA) is increasingly rich and diverse, there remains limited research into the developmental aetiology underlying the experience of MPA. There are a number of factors that may mediate the likelihood and severity of developing MPA from childhood to adulthood, including innate temperament, trait anxiety, interpersonal experiences (e.g. interactions with parents), and perceptions and interpretations of the world; however, MPA has primarily been explored in relation to cognitions, temperament, physiology, and here-and-now social context factors. But broader literature into the development of anxiety disorders has demonstrated that early social environments are important contributors to the development of anxiety disorders in adulthood. This is particularly true of Social Phobia, which has also been shown to be significantly higher in musicians who experience MPA. This indicates that investigations into the early social environments of musicians and the resultant social schemas (cognitive frameworks) that develop may be particularly pertinent in better understanding and treating MPA.

Aims

This study applied Jeffrey Young's Early Maladaptive Schema (EMS) framework to provide a social and emotional processing schema model for conceptualizing MPA in a developmental context (i.e. by providing an explanation for the impact of early environmental experiences on the development of these schemas, and their role in individuals' experiences of MPA). The study aimed to determine which, if any, of Young's EMSs are predictive of experiences of MPA in adulthood.

Method

This study investigated the relationship between EMSs and MPA as assessed by the Young Schema Questionnaire and the Kenny Music Performance Anxiety Inventory via an online survey. The survey was completed by 100 adult classical musicians of varying experience and age, who comprised tertiary students, amateur musicians, and professional performers. A follow-up semi-structured interview of a small subset of participants was then completed to further investigate early social experiences.

Results

Overall, the project's initial findings indicate that EMSs are strongly predictive of MPA in adulthood, and factor analytic investigations have identified particular early environment experiences (e.g. hypercritical parenting) that may be predictive of MPA.

Conclusions

Findings are discussed and elaborated, alongside implications for clinical interventions, teachers, parents, and institutional settings.

Keywords

Music Performance Anxiety; Early Maladaptive Schemas

ACTION HEROES WITH AMBIVALENT BODIES: CULTURAL VALUES IN THE RECEPTION OF RECORDED PIANO PERFORMANCE AND PIANISTS' HEALTH AND SKILL DEVELOPMENT

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Background

Despite three decades of research into musicians' wellbeing and development of skill, many piano players continue to suffer pain, injury, and poor progress. The current paradigm in this field characterizes professional pianism as a physically challenging task which requires a long and arduous training, and this also reflects traditional approaches

to piano technique pedagogy. But closer inspection reveals that this view is not well supported by research findings or other areas of evidence. However, it does appear to fit the values of Western culture around the body, gender, and the moral importance of hard work.

Aims

This study explores the presence of cultural values in the reception of recorded piano performance. It forms part of a PhD project which investigates how cultural values manifest in various discourses around piano playing, and how they may influence our understanding of pianists' occupational musculoskeletal health and technical skill development.

Method

Reviews of recorded piano performance written by professional critics were examined qualitatively via discourse analysis. The data selected consisted of 89 CD reviews from five recent issues of *International Piano* magazine. Analysis was divided into three stages: descriptive coding by topic of discussion (*what* was said), linguistic analysis of coded material (*how* it was said), and interpretation of the results of the first two stages in terms of Western cultural values, with the body, gender, and hard work as "fuzzy lenses."

Results

Two themes emerged: Western society's acknowledged ambivalence around the body, and a classic (and heavily value-laden) narrative form in Western culture: the hero story. The first theme was reflected in a denial of the body co-existing with physical "sensationalism." Cerebral qualities of performances were praised and bodily aspects of pianism minimized. Yet reviewers also invoked the physical by describing the extreme technical difficulties of the music played, and applauding performances which provoked visceral reactions in the listener. Fragments of the hero story were found throughout the dataset in terms of elements of the typical plot, characterization, and setting. These portrayed the pianist as an action hero, embarking on a dangerous adventure with the aim of victory over the difficulties of the repertoire as well as his "rival" pianists.

Conclusions

Results suggest that performance reception discourses could contribute to limiting the way we think about pianists' health and skill development: We may be reluctant to consider evidence which does not fit the hero story, for example the occurrence of pianistic virtuosity outside the physical prime of life (the hero is typically a young to middle-aged adult). Ambivalence around the body's role in pianism may also discourage close attention to the biomechanics of technique, leaving in place pedagogical practices which seek to build speed, strength, and stamina without consideration of the ergonomics involved. It is therefore suggested that to better understand the health and skill development needs of pianists we may have to think outside of narratives and values in which we are deeply invested as individuals and as a culture.

Keywords

recorded performance; reception; piano; occupational musculoskeletal health; skill development

REHEARSING AND PERFORMING IN CYBERSPACE VIA LOLA

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Background

Advancements in videoconferencing technology are increasing possibilities for performers to collaborate over the internet. Higher Education institutions are now providing opportunities for synchronous distance teaching and learning. However, the challenges posed by the technology to overcome latency have, until recently, prevented musicians from performing remotely. A Low Latency Audio and Video Streaming System (LoLa) has been developed, allowing musicians to work over high-speed networks with minimum delay and excellent sound and video quality. Research in this field is however scarce, focusing mainly on teaching with only a few references to performance.

Aims

This investigation focuses on how musicians, who never met before, communicate and interact during rehearsal and performance via LoLa. It explores the participants' previous experiences with technology, their rehearsal strategies,

and social interactions in performing over the internet, as well as the impact of the technology on rehearsal and performance.

Method

Participants were tertiary level guitar students in the UK (n=2) and in Denmark (n=2), and two professors (UK/Denmark). Study 1 involved two guitar duos and Study 2, a quartet bringing all participants together. We will report on results of Study 1. The piece *Three Fragmentos* by Shingo Fujii was selected for its challenges of synchronicity, interpretation, and ensemble playing. The participants had three 30-minute rehearsals, one coaching session, and one public performance, all via LoLa. Data were collected through video recordings and observations of all sessions; semi-structured interviews conducted before sessions started, during the rehearsals, and after the performance. Video-stimulated interviews were carried out several months later, when the participants reflected upon the whole process. Interpretative Phenomenological Analysis has been used for data analysis.

Results

All participants had experiences with technology but none in playing chamber music at distance. They stated not having rehearsal plans, mostly reacting to musical and technical needs in a "natural way." Playing via LoLa led to important reflections on their new, emerging rehearsal and performance strategies. Although mostly the same as in face-to-face rehearsals (e.g. tuning, slow practice, short sections), some aspects had to be adapted. For example, eye contact was impossible due to the camera's positioning, and participants had to develop "peripheral vision" of the other player. Volume was controlled by engineers, balance evaluated through speakers, and attack, tempo, and synchronicity became the main focus of attention. The importance of social interactions in forming a cohesive ensemble was highlighted by the awkwardness in the beginning but this was quickly overcome; closeness was achieved through sharing "this unique experience" rather than socializing. Lastly, unable to "feel" the other's presence, participants relied mainly on verbal communication for making musical and technical decisions although non-verbal communication—mainly through gestures—was also important to establish leadership in the ensemble. Participants highlighted that the technology demanded more concentration and acknowledged becoming fully immersed in the music and in the experience, despite the technology and the presence of engineers. They were also surprised by the good quality of their performances.

Conclusions

Our study suggests that performers can fully engage with the technological developments of the 21st Century. The results show that LoLa is a successful and innovative way of connecting remotely for rehearsing and performing. The participants were able to adapt and develop new strategies for working remotely. This has important implications for musical education highlighting the importance of preparing students for the use of the latest videoconferencing technology in their professional careers. We hope that this investigation has helped cast a light on how this medium has opened new and exciting horizons for students. By participating in our study, the musicians have been pushed to adapt their working strategies to perhaps the most recent and unusual of all venues: cyberspace.

Keywords

videoconferencing; rehearsal; performance; communication; technology

EFFECTS OF VIOLINISTS' SKILL ON THE SPATIAL-RADIATION CHARACTERISTICS OF VIOLIN SOUND

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Background

Violin playing techniques include mapping techniques from score to "sound" such as fingering and techniques for vibrating the body of the violin in a form applicable to the instrument. Depending on the vibration characteristics of the violin body, the direction and extent of intensely radiated sound change according to frequency. In a space with reflections and echoes such as a concert hall, there is a high possibility that the spatial-radiation characteristics of a violin will contribute to violin timbre. To clarify the contribution made by the violinist's skill to violin timbre, it is necessary to clarify the relationship between the violinist's skill and the violin's acoustic spatial-radiation characteristics during a performance.

Aims

The aim of this research is to investigate the relationship between proficiency in playing a violin and the spatial-radiation characteristics of the violin at the time of a performance.

Method

Several violinists in each of the amateur, semiprofessional, and professional classes were participated in this experiment. Some of the professionals were actively performing around the world. We used more than ten types of modern violins used for practice and concert performances and made sound recordings of the violins in an anechoic room at a sampling frequency of 48kHz with 24-bit quantization. In this room, 42 compact microphones (DPA 4060 or JTS CX-500) were arranged in a spherical array around the violinist. The radius of the array was 80cm.

Results

For violinists with a low level of proficiency, experiment results revealed that radiation directivity was weak regardless of the frequency of the radiated sound. Here, "radiation directivity" refers to the radiation of sound biased toward a specific direction in space. Saying that radiation directivity is weak therefore means that violin sound is radiating broadly in space. In the low and middle frequency ranges (<1kHz), sound radiating backward from the performer was also observed without any downward radiation toward the floor. However, for world-class violinists, it was found that clear directivity peaks were formed in the low range (around 400Hz), middle range (around 1kHz), and high range (3kHz–4kHz) of radiated sound regardless of the type of violin. The radiated direction of this sound was downward for frequencies under 1kHz and upward (toward the ceiling) for higher frequencies. Almost no backward radiation was observed.

Conclusions

In this research, we investigated the relationship between violin proficiency and the violin's spatial-radiation characteristics. We found that the skill of a violinist is reflected in the spatial-radiation characteristics of the instrument. This result suggests that the spatial-radiation characteristics of a violin may be used as an effective "measuring rod" of a violinist's skill.

Keywords

violin; acoustic space; musical performance; musical skill; directivity

Acknowledgments

SUBJECTIVE ASSESSMENT OF SOLFÈGE-BASED ABILITIES CORRELATES WITH PERFORMANCE BEHAVIOR OF PROFESSIONAL PIANISTS

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Background

When specializing in piano performance at university, students are often required to participate in accompaniment and ensemble playing in addition to solo performance lessons. The ability to read and perform a music score quickly as requested, is related to sight-reading ability. Although sight-reading is trained primarily in solfège classes, individual differences exist in this ability. This is clear from the fact that very few pianists can become a corépétiteur. While sight-reading is a visual-based capability, ear-play is the ability to play tunes on the piano only by listening. It is not considered very important in classical music but is an essential ability for other fields such as jazz. Recognizing melody and harmony by ear is also trained in solfège classes as music dictation.

Numerous studies have been conducted on sight-reading ability and its relation to general performance. A previous study showed that the presence of sound influences the memorization of music for a pianist who can ear-play well. Furthermore, it is empirically known that there are individual differences in whether sight-reading or ear-play is easier for a pianist. The priority of sight-reading (visual) and ear-play (auditory) can influence performance behavior in general. In addition, these solfège-based abilities may depend on pre-university music education.

Aims

The aim was to explore the relationship among solfège-based ability, performance behavior and preference, and influence of music education.

Method

We conducted a questionnaire survey consisting of 42 questions about performance experience, music education history, ordinary performance behavior, and music preference. The participants were 75 pianists, all present or past majors in classical piano performance in the music department of a university. Based on the responses, we performed exploratory analysis on the relationship between solfège-based ability and pianist behavior, and the influence of pre-university music education.

Results

We mainly analyzed subjective assessments about solfège-based abilities, such as sight-reading, ear-play, and music dictation, for melody and harmony, and memorization. The music dictation ability for both melody and harmony correlated with sight-reading, ear-play, and memorization. Sight-reading and ear-play were not positively or negatively correlated. There was a positive correlation between ear-play and memorization. The low subjective assessment score for memorization was related to onstage memorization anxiety and the tendency to make onstage failures related to the memorization of the score. Weakness in sight-reading correlated with a tendency to make a misstep at a big leap. The subjective assessment of solfège-based abilities was not related to whether or not they specialized in music performance at high school. Ear-play ability depended on whether they had played the piano only for fun, and from early childhood to elementary school. Despite the small sample, there is a possibility that a specific early music education raises a pianist with excellent ear-play ability.

Conclusions

The subjective assessment of sight-reading, ear-play, and music memorization of the pianist was found to be related to onstage behavior. It was also observed that a specific early music education could improve ear-play ability.

Keywords

pianist; solfège; sight-reading; ear-play; music memorization

Acknowledgments

RUDIMENTARY STUDY OF ASSOCIATION BETWEEN THE MOTION AND EMOTION BY THE CHINESE PIPA PERFORMANCE

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Background

We have previously examined the motion and emotional expression in keyboard instrument performance. In the previous study, we examined performance motions of a professional pianist demonstrating five emotions and emotionless playing using a motion capture system. From the results, we understood that the motion of the head, neck, and shoulders changed depending on the emotional expression of the music.

Aims

In this study, we examined the relationship between emotions and motion in Chinese pipa performances. The aim was to compare European and Chinese music in relation to the apparent motion and each of the six emotions.

Method

The performer was a professional Chinese pipa player. The performance motion was measured using a motion capture system. The player performed a melody expressing each of five emotions (happiness, tenderness, anger, sadness, fear) used by Juslin as well as an emotionless performance. We compared the motion fluctuation width of the upper body, then we calculated the standard deviation and frequency of the motion for each emotion.

Results

The standard deviation values of the motion of "anger" and "fear" were found to be high. From this, we found that the active and negative emotions showed high standard deviation values in relation to player's motion.

Conclusions

The music of this study was different for each emotion. Even with the differences in the music we found that there is an association between emotion and motion.

Keywords

motion capture; Chinese pipa; music performance; emotion; motion analysis

Acknowledgments

PRACTICE PROCESS ANALYSIS USING THE SCORE MATCHING METHOD BASED ON OBE-DTW AND ITS EFFECTS ON MEMORIZING MUSICAL SCORES

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Background

In order to improve the performance of a musical instrument, efficient practice is important. It is very useful for learners to observe how good performers practice; however, analyzing a long-time practice manually and objectively is difficult. In this study, we analyzed the MIDI recorded piano practice by professional pianists using the Score Matching Method based on OBE-DTW (Open Begin End Dynamic Time Warping) and observed a practice process of piano performance. In addition, even if all pianists were given the same practice time and completed their practice, there is a big individual difference in the effort involved in memorizing the musical score. There is a possibility that the differences in the practice process can increase or decrease the effort involved in memorizing the music. Therefore, using the results analyzed by the proposed method, we also observed the effects of the practice process on memorizing the music.

Aims

The aim of this study is to analyze the piano practice process using the Score Matching Method based on OBE-DTW and observe the effects of the practice process on the effort involved in memorizing the music.

Method

We propose a matching-intensity calculation method based on OBE-DTW. The method begins with calculating OBE-DTW tables to obtain the time-delay-invariant distances between the correct musical pattern of each part and the practice score. We use the inverse of the normalized distances at the end points of the tables as the matching intensity of the corresponding musical pattern. The data used for this analysis was the MIDI recording when eleven professional pianists were practicing the piano. All the pianists had graduated with a degree in piano performance from a school of music. The task music was the first part of "Mazurka" from *Escenas Romanticas* by Granados. The pianists reported that they had neither played nor heard this Mazurka before. First, pianists were required to play the music by sight-reading. Then, they practiced for about 20 minutes as usual. After that, they were asked to perform the task music from memory without any advance notice.

Results

During the practice, the difference between the correct musical pattern and played music pattern is large and the tempo changes frequently. However, the proposed method could estimate the part that the pianist practiced at each time. Using the analyzed results, the relationship between the practice process and the effort involved in memorizing the music was investigated. As a result, six pianists who demonstrated good performance in music memorization would often practice throughout the whole music or practice through the first half and the second half. However, the five pianists who demonstrated poor performance in music memorization would often practice by dividing the music into short segments. This result suggests that it is important to listen to the flow of the entire music and to practice by connecting each part of the music.

Conclusions

The practice process analysis using OBE-DTW revealed the possibility that grasping the flow of the entire music can be more useful in memorizing the music, rather than practicing short segments of the music.

Keywords

OBE-DTW; automatic score matching; piano practice analysis; music memorization; sight-reading

Acknowledgments

MAPPING THE MOTOR PATTERN VOCABULARY OF AN ARTIST-LEVEL JAZZ PIANIST

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Background

Corpus research of jazz solos typically use transcriptions from extant audio recordings. These data lack accurate timing and dynamic information, limiting the scope of possible research questions. In the current project, we are collecting MIDI data from live performances by one of the authors who is an artist-level jazz pianist. We use the newly available Bluetooth MIDI protocol to collect data that minimize distractions due to the recording for the pianist, other musicians, and the audience.

Aims

In addition to identifying pitch and rhythm patterns, the exact timing and velocity data will be used to identify motor patterns and the boundaries between those patterns. According to Pressing's prominent theoretical framework, musical improvisations consist of concatenated motor patterns. Accordingly, boundaries between these patterns should exist in extant improvisations. Schmidt defined Generalized Motor Patterns (GMPs) as an abstract movement structure in which the proportions of relative timing and relative force are constant. He later identified the boundary between two GMPs using correlations among times of kinematic landmarks within a longer lever movement. In our recent pilot study, MIDI data from solos by different jazz pianists were used to identify motor pattern boundaries through correlations of timing and velocity data from different iterations of the same pitch pattern. However, the number of identified motor patterns was limited as patterns were compared across different players. The current study will allow us to map the vocabulary of motor patterns from one player.

Method

MIDI files were recorded during live performances using a Bluetooth MIDI interface and Cubasis LE for iPad. The MIDI files were analysed using MIDI for MATLAB and scripts created by the first author. Initially, all chords were erased to focus on solo lines played primarily by the right hand. Then patterns were identified and correlations of relative force and relative timing calculated between different iterations of the same pattern to determine if subsequent notes were part of the same motor pattern.

Results

A corpus of a total of close to 500,000 notes is currently being analyzed. Results will be available by the time of this presentation.

Conclusions

Conclusions are forthcoming.

Keywords

motor pattern; pitch pattern; jazz; improvisation; piano

PHRASE-LEVEL MODELING OF EXPRESSIVE DYNAMICS IN VIOLIN PERFORMANCES

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Background

Computational models for expressive music performance attempt to understand and emulate the variations in timing, timbre, and dynamics that musicians introduce when performing a musical piece. In the context of music learning, such models provide a valuable tool for teaching students how to play expressively, which is a difficult task from a pedagogical perspective. Very few approaches have been proposed for modeling expressive performance in the violin, and most of them target note-level prediction, missing on the context-sensitive nature of expressive interpretation.

Aims

This study presents a method for automatically estimating plausible expressive variations in dynamics for a violin rendition of arbitrary music scores with the purpose of facilitating expressive performance learning by students. The approach is based on analyzing a database of expressive performances recordings by experts, comparing the performed scores with a new score, and adapting the experts' transformations to render an expressive performance of the new score.

Method

A target musical score is automatically segmented into phrases based on the Local Boundary Detection Model algorithm. For each segment, a search is made in a database of music scores performed by expert violinists to find the closest match according to a melodic distance measure computed using dynamic time warping. The dynamics curve outline of the match and its relative dynamic level are then applied to the target phrase generating the output. Initial testing has been conducted by recording performances of a violinist for usage as both reference for the predictions and test set for analysis in a leave-one-out approach.

Results

Preliminary results indicate that the predicted dynamics approximate performed dynamics well only when the similarity measurements between desired phrases and matching references remain below a certain threshold. Specifically, dynamics predicted for the segments with close matches show a mean correlation coefficient of 0.57 ± 0.22 when compared to dynamics performed by an actual violinist with 95% confidence. Due to the nature of our experimental procedure, there were no attempts to predict the dynamics of one performer based on samples of different ones, nor to observe the effects of a database containing samples of mixed musical genres and recording settings.

Conclusions

The method proposed shows potential for modeling not only dynamics but also other aspects of music performance. As the above results suggest, considering a large database of reference performances is very likely to improve the accuracy of predictions. The obtained results seem to corroborate that melodic and rhythmic aspects of musical pieces affect their interpretation by musicians.

Keywords

music performance; computational modeling; machine learning; violin; music expression

Acknowledgements

THE RELATION BETWEEN FORCE PRODUCTION OF THE TOE FLEXOR AND POSTURAL STABILITY IN DANCERS

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Background

Previous studies had reported that toe flexor strength was important to maintain postural control, although functional significance of the toe flexor has not been fully elucidated. Rowly and colleagues had reported that dancers showed significantly greater strength of toe flexor than non-dancers. Toe flexor strength might have some influence to postural stability. However, the relation between toe flexor strength and postural stability in dancers is unclear.

Aims

The purpose of this study was to evaluate the relation between toe flexor strength and dynamic balance capability. So we examined the COP sway during standing and the toe flexor strength in ballet dancers and controls.

Method

Subjects were 24 healthy females including university dance major students (n=12) and age-matched controls (n=12) without any previous dance experiences. Using a force plate (Kistler AG, Switzerland), we measured Index of Postural Stability (IPS), which is for assessing postural stability during standing and shifting of body weight. The examiner confirmed no lifting of the heels visually. Toe flexor muscle strength was measured using a toe-grip dynamometer (TKK.3360, Takei Co Ltd, Japan). Subjects performed three maximum effort trials, and the best value was used for analysis. Subjects were asked to exert force gradually ranging from 0% to 50% of maximum strength. Root Mean Square and jerk was also calculated for further analysis. And we also examined associations among these measurements by t-test and the Pearson's correlation coefficients.

Results

IPS index and the toe flexor strength were significantly higher in dancers compared with controls. In dancers, IPS index and toe flexor strength were correlated.

Conclusions

From the results in this study, it is suggested that assessment of toe flexor strength as well as temporal patterns of force production would be important to assess postural stability.

Keywords

dancer; toe flexor strength; postural stability

MUSIC IN THE COMMUNITY: INVESTIGATING THE EFFECTS OF GROUP MUSIC MAKING PROGRAMS ON OLDER ADULTS AND HIGHER EDUCATION MUSIC STUDENTS

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Background

The United Nations has recently predicted that by 2050 the global population of people aged 60+ will increase from 605 million to 2 billion (WHO 2014). This trend makes even more urgent the need to address the social problems that often affect older adults such as loneliness, depression, and feelings of inadequacy. Although we have evidence that creative activities can improve the health and wellbeing of residents in nursing homes, literature exploring the effects of music on this population is still limited, especially in relation to music interventions. At the same time, to date there has been little research on the benefits of leading such musical activities on the musicians themselves, as well as on the mutual benefits resulting from the interactions between musicians and older adults. Developing research in these fields is very important, as a deeper understanding of these issues may be relevant for music institutions, music practitioners, and stakeholders and may enhance the role of music in our communities.

Aims

This presentation will report data from Art for Ages, a multidisciplinary project involving both nursing homes residents and higher education students doing 10-week programs of group music making. The aim is to explore two research questions: (RQ1) How do participants in these programs describe their experience? (RQ2) Does the participants' involvement have any impact on their music habits?

Main contribution

The collected data allow us to observe the impact of music activities from two perspectives: on the one hand, interviews were undertaken to explore residents' experiences and the effects of their engagement with music. On the other hand, interviews, pre-post questionnaires, and oral diaries were undertaken to explore the effect of this experience on students, with particular regards to their professional identity, wellbeing, and career expectations. Data analysis is underway, set to be completed prior to the ISPS conference. Preliminary analyses of the older adults' data show a strong commitment and a number of positive feelings associated to being involved in music activities, while the students' data reveal an increase in their self-esteem and self-motivation, as well as a will to continue to be somehow involved in such a kind of activity.

Implications

This study is an important step towards understanding how affordable music interventions may affect the quality of life of nursing homes. The results are also relevant for higher education music institutions aiming to offer broader curricula to their students, to enhance their career prospect and to promote audience development activities.

Keywords

music and wellbeing; musical impact; older adults' wellbeing; students' wellbeing; participative art

INTERACTION PATTERNS IN MUSIC REHEARSAL PROCESSES: A LONGITUDINAL CASE STUDY OF A NEWLY-FORMED VOCAL ENSEMBLE

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Background

The process of preparing for ensemble performance involves both musical and social interactions, generally achieved through a framework of rehearsals and performance goals. The ways that groups achieve these goals varies widely, but there are many common elements, both explicit and tacit. This research uses observations of explicit verbal behavior to investigate tacit interactions, by exploring interaction patterns. Previous research has established ways that interaction patterns can indicate emergent behavior in small groups. Research in group creativity suggests links between patterns of verbal interaction and creative outputs. There is also a tension between creativity, and working towards a pre-defined goal. Studies in high-performing teams in aviation and medicine showed that patterns which emerged early in team development lifecycles influenced subsequent coordination and effectiveness. Small chamber ensembles share some characteristics of creative, expert teams, providing a context in which to explore interactions, and their role in the rehearsal process.

Aims

As part of a longitudinal study of a newly-formed vocal ensemble, the aim was to explore the relationship between verbal behaviors, rehearsal activities, and stage of preparation for performance, by: (1) observing developments over time from rehearsal to performance; (2) observing member interactions when working on different rehearsal subtasks; and (3) evaluating a pattern detection technique.

Method

Participants were advanced students (3 female, 2 male), at the University of York, studying for the MA in Solo Voice Ensemble. They were assessed and taught as a group for the duration of the three-month study period. The participants used a video camera to record their self-directed rehearsals, and provided qualitative assessment of each rehearsal. For analysis, verbal interactions were transcribed from the video recordings, and coded according to a predefined schema based on Interactive Process Analysis. Details of rehearsal task and duration of episodes of rehearsal talk were also captured. Temporal patterns were investigated using the pattern detection software THEME ® (PatternVision).

Results

Early results from this ongoing study reveal changes across rehearsals in frequency of contributions and behavior type by ensemble member and total airtime by member. The amount of time spent on different rehearsal tasks varied throughout the group's preparation.

Pattern detection analysis revealed the presence of complex, recurring interactions, involving different ensemble members and their contributions by behavior type. These patterns varied with fluctuations in rehearsal focus and sub-task.

Conclusions

Fluctuating task demands are part of the dynamic environment in which ensembles form, work towards, and achieve performance goals. This study found relationships between task demands, verbal behavior, and interpersonal interactions. Pattern detection techniques were used to uncover the presence of "hidden" patterns of communication in rehearsal.

Combining qualitative observation and pattern detection has the potential to advance understanding of how interaction patterns facilitate the coordination of creative group processes in music ensembles and beyond.

Keywords

music ensemble performance; rehearsal; interaction patterns

THE ACCURACY OF THE ADVANCED PIANIST'S SIGHT-READING AND DISCRIMINATION: HOW ARE THEY RELATED TO MUSICAL EXPERIENCE AND TRAINING?

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Background

According to the literature, good sight-readers can look ahead more than poor sight-readers, suggesting the former's more efficient information processing than the latter. Is the good sight-reader's cognitive advantage unique to "sight-reading," or can that be observed in another task also involving music reading and sound monitoring? Moreover, the kind of skills required in music sight-reading can be developed through everyday music practice and specialized training. It is still unclear how such experiences relate to a sight-reading performance.

Aims

The purpose of the present study was two-fold: to investigate whether the accuracy in the advanced pianist's sight-reading would relate to that in a discrimination task between the score and the sound and to reveal how various musical training and experience would relate to the accuracy of their sight-reading and discrimination performances.

Method

Fourteen advanced pianists with 11-54 (M=18.21, SD=10.55) years of piano lessons participated in the study. All participants first sight-read three two-voice pieces in either major or minor, and then performed a discrimination task in which they judged whether the single melody shown in a score was the same as or different from that played aurally. The discrimination task (consisting of 27 major, minor, and atonal stimuli) were given in three conditions: the score first, the sound first, and together. The order of conditions in the discrimination task was counter-balanced while stimuli were presented randomly.

Results

Spearman's correlation coefficients showed no correlation between the number of errors (Ms=14.01–29.86, SDs=11.70–40.18) or stuttering (M=19.43, SD=26.00) in sight-reading and the proportion of accuracy in discrimination tasks (Ms=0.76–0.87, SDs=0.46–0.34). High positive correlations (r_ss=0.64–0.99, ps≤0.01) between the number of pitch errors and that of rhythm errors, as well as between the number of rhythm errors and that of stuttering, may imply that the accuracy of sight-reading performances can be measured in any of these parameters. A high negative correlation (r_s=-0.65, p=0.01) between the number of lengthened rhythm errors and the duration in previewing a score in the score first condition of the discrimination task appears to indicate that better sight-readers tend to spend more time in inspecting a score for a discrimination task. Moreover, a high negative correlation (r_s=0.66, p=0.01) was found between the number of lengthened rhythm errors and the total years of training in sin-

gle-voice ear-training. The number of stuttering was also negatively correlated (r_ss=-0.65–-0.76, ps≤0.01) with the years of training in tonal harmony, single-voice ear-training, and the frequency of activities such as musical analysis, single-voice ear-training, and multi-voice ear-training during the past year, implying the role of analysis and aural skills in a sight-reading performance, supporting the literature.

Conclusions

This study has empirically revealed that the accuracy in sight-reading relates to a preview of a score during an aural discrimination, as well as to both the extensive training and the recent engagement in ear-training.

Keywords

sight-reading; discrimination; error; training; piano

MUSIC-ENHANCED EMOTION IDENTIFICATION OF FACIAL EMOTIONS IN AUTISTIC CHILDREN: AN EEG STUDY

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Background

Scholars in psychology have shown an increasing interest in techniques that involve music as a non-invasive treatment for people who have difficulties in interpreting and displaying emotional states. Music therapy has shown promising results in high and low-functioning autistic individuals.

Aims

The present study aims to investigate the effectiveness of using music as a tool for enhancing visual emotion stimuli processing in autistic children. With this aim, music with clear emotional content was matched to real human faces expressing four basic emotions (happiness, fear, anger, and sadness). The aim was to assess the effect of music on both emotion perception and induction.

Method

Participants were 6 children aged 6-10 years (mean age 8 years, SD=0.98, 6 male) attending C.E.E. Carrilet (Barcelona). Diagnosis of ASD was performed by an experienced clinician on the basis of DSM-V criteria, their current symptoms and developmental history. All children showed an IQ≥80 (measured using the Wechsler Intelligence Scale for Children). Participants were showed pictures of faces from the Karolinska Directed Emotional Faces database. The music used was collected by UPF musicologists and consisted of a set of 100 different soundtracks with 4 different emotional states (sadness, happiness, fear, and anger). Four weekly sessions were conducted. In each session, participants were exposed to 3 sequential conditions: (C1) pictures with no music, (C2) pictures with emotion-matching music, and (C3) pictures with no music. In addition to verbal responses, EEG data from participants were collected to assess neural activity effect of music within sessions and over the entire treatment (4 sessions).

Results

Regarding the verbal responses evaluation, a paired-samples t-test was run, thus allowing us to contrast the scores in condition (C1) longitudinally. The results show a statistically significant effect, especially when the first and fourth sessions are contrasted in terms of overall mean score (p=0.01). Regarding the EEG analysis, the problem was modelled as a balanced 4-class classification task, and support vector machines (linear kernel) were applied to train a classifier. A repeated measures t-test was applied to the F-score results of the first and fourth session (condition C1). Results obtained in the t-test suggest that there is a statistically significant difference between the scores obtained in the first and last sessions (p=0.012).

Conclusions

Significant improvement in inter-session responses was found both in terms of verbal and EEG responses. This shows the potential of music as a tool for improving autistic children's emotion recognition in facial expressions.

Keywords

music therapy; emotions; autism; EEG

Acknowledgements

INTEGRATION OF PERFORMANCE, PROCESS, AND PRODUCT FOR EVALUATING ARTWORKS

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Background

Today, the arts are the media which provide powerful and essential means of communication. For every artist was first an amateur, thus artistically literate citizens apply a variety of artistic media, symbols, and metaphors to independently create and perform work that expresses their own ideas and communicates their life experience. Social Communication is a relatively new term that has emerged over the last decade. It may appear to be a "new" concept that is a regrouping and re-categorizing of the previously known concepts of social interaction, communication, and language. This process is able to respond by analyzing and interpreting the social communications of others. Thinking about art as a process of social communication, this article intends to understand how the relationship between the artist and the audience is potentially altered in social communication. Therefore, this study proposed a research framework.

Aims

In the research framework, the artist involves three key stages to express significance through their artworks: performance (inspiration), process (ideation), and product (implementation). For the viewer, there are three key steps to understand the meaning of an artwork: recognition (attracting), realization (accuracy), and reflection (affecting). For the communication theory, three levels of problems are identified in the study of communication: technical, semantic, and effectiveness. For the mental model, Norman proposed a conceptual model that includes three parts: design model, user's model, and system image. When a designer designs a product for a user, the designer expects that the user will understand and use it in the desired way, meaning that the user's model is identical to the design model. For emotional design, Norman proposed three levels of design processing—visceral, behavioral, and reflective design that represents three kinds of user's experience as aesthetic, meaningful, and emotional experience.

Method

The research was designed to take into account the changing nature of social communication, resistance to artwork evaluation, and the context for evaluation and impact assessment. It involved the following steps: (1) a review of current claims for artistically literate citizens in relation to arts practice and social communication; (2) exploration of the purpose and nature of evaluation and impact assessment; (3) development of an evaluation framework and tools for assessing the impact of artwork; (4) recommendations for development of the framework and evaluation of a communication matrix; and (5) validation of the communication matrix for evaluating artworks.

Results

In contrast with existing evaluation tools, this is a multi-dimensional tool that places the artist and artistically literate citizen's values at the core of the matrix. Its first dimension facilitates the identification of the core values involved in any artworks, including performance, process, and product. Its second dimension facilitates identification of the related theory that may need to be taken into account in assessing outcome and impact. These include communication theory, mental models, and information processing. The third dimension is the flexibility, as the matrix can be adapted to the needs and priorities of the different context of the artist, viewer, and artworks. It allows relevant measures and indicators of quality and impact to be identified.

Discussion

How the artist's performances are conceived, developed, delivered, and received, and how the viewer is attracted, accurately understanding the artwork, and affected by the artwork which all need to be studied. Results of this study proposed a set of attributes of communication for evaluating artworks in practices. For future studies, we need a

better understanding of performance, process, and product not only for the artist and artworks, but also for the viewer and social communication. While artistically literate citizens have become important issues in the interactive experience between artist and audience, it becomes a key issue in social communication and is worthy for further in-depth study. However, the effectiveness of using the proposed communication matrix needs to be further enhanced. This can be done by incorporating with more information of best practice in artist's performance, process, and product.

PRACTICE COGNITION AND BEHAVIOR IN EXPERT PERFORMERS AND MUSIC MAJORS

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Background

Music research often examines practice by attending to observable variables (e.g. practice strategy use, time spent). In this study, we take a different approach to describing practice by revealing cognitive processes that underlie musicians' practice behaviors; in other words, what are musicians thinking during practice? How closely do observed practice behaviors align with their thinking?

Aims

The purpose of this study was to describe similarities and differences in the cognitive and behavioral elements of expert performers' and collegiate music majors' practice.

Method

Subjects (N=15) were music majors (n=8) and expert performers (n=7) at six universities in the U.S. Musicians were videotaped for approximately five minutes while practicing one self-identified goal in literature they were currently working on. Before beginning, musicians were primed that immediately following their practice, they would watch their video recording and provide detailed verbal recall of the thoughts that had occurred during practice. Immediately following the recall component of data collection, participants were briefly interviewed.

Recall data and free-response interview data were coded using elements of music performance (e.g. note accuracy, rhythmic accuracy, motor coordination, phrasing) as well as non-musical variables (e.g. goals, body awareness, process, emotional state). We also performed a content analysis of behaviors observable in the videos, noting strategy use, repetition, trial-to-trial success, and overt behaviors that conveyed physical and emotional states (e.g. body tension, frustration).

Results

Triangulation among the three forms of data revealed striking differences in practice cognition and behavior between expert performers and music majors. Expert performers tended to report thoughts that included compound elements of music performance (e.g. one thought included aspects of phrasing, articulation, body awareness, and theoretical analysis), whereas music majors tended to express thoughts that included fewer elements of performance (e.g. note accuracy only, or note and rhythm accuracy together). Experts reported focusing on the end goal of conveying expressive music to an audience, whereas students expressed thoughts related to specific strategy use, and often reported that they were deliberately postponing the incorporation of musicality in their proximal goals in order to focus on the technical demands of repertoire. All musicians employed common strategies throughout their work, including the isolation and repetition of problematic passages, and almost all demonstrated behaviors that conveyed an emotional response related to their progress. When problems were identified in practice, experts more often demonstrated a willingness to slow down (tempo) and limit the scope of the targeted passage in order to execute trials with all aspects of authentic musicianship.

Conclusions

These data illuminate aspects of music practice cognition and behavior that inform how musicians may optimize practice. Clearly, there are limitations to consider given that examining practice in this manner is inarguably messy; however, understanding how expert musicians think and behave as they practice provides an important model for aspiring professionals.

Keywords

HOW TO STAY CONFIDENT: MOTIVATION, WELLBEING, AND PRACTICE-BEHAVIOR AMONG CONSERVATOIRE MUSIC STUDENTS

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Background

Music has the power to facilitate physical and mental health. By contrast, studying music and becoming a professional musician is often accompanied by continual stress and music performance anxiety. This has to be taken seriously as a potential threat to music students' wellbeing and health. According to self-determination theory, motivation is associated with wellbeing and the satisfaction of the psychological needs autonomy, competence, and social relatedness. Consequently, it deems necessary further investigation in order to foster a healthy and flourishing career.

Aims

One major goal of the study is a holistic and critical approach to the decisive role of music students' self-determination in terms of autonomous versus controlled motivation, perceived choice, and awareness of self, subjective wellbeing, and self-regulated practice behavior. The purpose of this investigation is to support and empower music students from a music psychological and educational perspective. Therefore, efficient self-regulatory strategies will be evaluated and provided to facilitate a successful, meaningful, and healthy life as a professional high-performance musician.

Method

Undergraduate and graduate music students complete standardized self-report questionnaires. The Cronbach's alpha coefficients for all sub-scales range from 0.62 to 0.85. The statistically analyzed surveys will give quantitative information about self-determination, wellbeing, and practice behavior. Qualitative interviews are conducted to evaluate self-regulation strategies. A short-term intervention will show the impact of a gratitude journal on motivation, wellbeing, and practice behavior.

Results and Conclusions

Data analysis is ongoing, and results will be presented at the symposium. Based on the findings of this study, application-oriented strategies specifically for music performance students will be identified. In addition to individual benefits, the insights will aim at promoting the development and implementation of diverse programs within or complementary to the curriculum at German universities.

Keywords

motivation; music psychology; self-regulated practice-behavior; self-determination; wellbeing

THE NATURE OF PRE-PERFORMANCE ROUTINES AMONG PROFESSIONAL ORCHESTRAL MUSICIANS

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Background

How performers prepare for performance and achieve repeated success has always been a subject of interest to researchers. While long hours of training are a given, the performance day itself is a separate entity where all preparation is expected to culminate. What occurs on this day is therefore crucial for performers to understand; the behaviors undertaken may be the difference between perceived success and failure. Pre-performance routines are one strategy that have been widely considered in sport and other domains such as business and surgery. Inspired by the lack of research into their use within music, this study sought to gain a holistic understanding of the nature of pre-performance routines for professional orchestral musicians.

Aims

This study investigated what cognitive and physical behaviors were undertaken by professional orchestral musicians in the hours before a concert to allow them to perform at their best. It considered whether there was consistency between the behaviors prior to multiple performances, which could therefore be deemed a routine. The purpose of these actions, and the impact of professional experience on the behaviors undertaken, was also of interest.

Method

This study employed a social constructionist qualitative methodology to understand the musicians' own interpretation of the phenomenon. Four professional orchestral musicians, with experience ranging from 10-40 years, completed self-report diaries on two concert days that asked them to note any behaviors they undertook specifically because they had a concert that evening. These behaviors were then explored in an in-depth semi-structured interview. All data were then coded using thematic analysis.

Results

Behaviors including a short playing warm-up two to five minutes prior to performing and arriving at the venue with time to spare were common among all participants. Sleeping or resting and spending conscious time changing and getting ready for the concert were common among a majority of participants. Experience was found to be an influencing factor; participants with more experience undertook more physical/mental behaviors and less mental/musical than the participant with least experience. Preventing stress, minimizing distractions, and "feeling right" emerged as over-arching themes to describe the function of the behaviors. The idea of a concert day having a series of transition moments where musicians actively narrowed their focus emerged as a point of interest.

Conclusions

This study extends the existing literature available on musicians' pre-performance routines while also validating it. The exploration of the function of behaviors sheds light on musicians' priorities before a concert, while looking at the purpose of all behaviors undertaken creates a holistic picture of the nature of routines. Implications for industry from this study are that minimizing or preventing stressful situations for musicians on a concert day should be a priority and that as the concert approaches, musicians should be allowed to focus on the task ahead, free from non-musical distractions. The lack of mental skills such as imagery and self-talk used by participants in this study presents an opportunity for skill development for musicians. Reasons for the lack of mental skills used are also considered.

Keywords

pre-performance routines; preparation; orchestral musicians; minimizing distractions; qualitative methodology

EXPRESSIVE SOUND AT THE PIANO OR EXPLORATIONS IN SOUND EXPERIENCE

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Background

"…The way that she would put her finger down, in a Russian way, of just the finger. The liveliness of the finger. And produce a B-flat. And you wanted to faint…"—Morton Feldman describing his piano teacher, Mme. Press.

The citation above points to the crux of a long-standing question about the art of piano performance: Can a pianist do anything to imbue a sound she makes with some special quality? Could Mme. Press really have played that B-flat so exquisitely that one would want to faint at the experience of hearing it? And further, if that experience was indeed available to Feldman, is it also available to any other listener?

Whether seen as lying outside the prerogatives of the pianist or as definitive of a pianist's art, the qualitative dimensions of piano sound have resisted clear definition or exhaustive description and have been notoriously difficult to explain or share.

Aims

This presentation develops a collaborative view of expressivity in sounds obtained at the piano (or sound production) by focusing on the pianist as a special sort of listener, and inviting the participation of other listeners in parts of the process of obtaining a sound. Departing from an interactive model of sound production, the research offered here

focuses on the role of artistic imagination and explores ways of guiding the imagination of listeners who are not at the piano, aiming to create a collaborative framework for the experience of expressivity in musical sound.

Main contribution

With brief reference to theoretical work on shared experience, and drawing on statements by Brendel, Sandor, and Neuhaus, as well as audience responses in recent, interactive workshops, this presentation proposes a theoretical framework for understanding expressivity in sound obtained at the piano (sound production), and develops the notion of "collaborative listening." Collaborative listening is partially explored through an interactive exercise, drawing on Neuhaus' work on "the artistic image" and specifically on a listening exercise Neuhaus devises, readily sharable by professional and novice listeners alike.

Implications

By developing an interactive model of piano sound production, and exploring ways of sharing a specifically pianistic mode of experiencing sound, this presentation addresses questions of artistic significance in piano performance, as well as larger issues concerning the enhancement of perceptual sensitivities and fine action control, the role of consciousness in experiencing perceptual stimuli, and the possibility of sharing first-person (artistic) experience. These larger issues emerge from specifically pianistic concerns, and remain grounded in the technical details and practicalities, especially as these relate to sound production.

Keywords

piano sound production; collaborative listening; Heinrich Neuhaus; artistic image; Morton Feldman

TIME TO DECIDE: DESIGNING A SIMULATED EVALUATION PLATFORM

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Background

Experiential learning and simulated environments are seeing increased use in the training of performance skills across domains, including sport, business, music, and surgery. While such situations often include an element of feedback delivered by a human judge, rarely is this act of evaluation considered a performance skill in equal measure or taught using the same immersive techniques. This despite the fact that such evaluations often take place under similar constraints, involving the execution of highly specialized knowledge, limited time, high consequences, unfamiliar environments, and complex social interaction with the performer and fellow judges. The majority of professionally trained musicians, for example, will incorporate evaluative roles as teachers, judges, and/or examiners into their professional portfolio, but research has demonstrated that domain experience does not necessarily lead to more consistent or reliable judgements. As these decisions form a cornerstone of organized musical education and practice, further tools are needed to develop this vital skill.

Aims

The work aimed to develop a simulated environment in which participants are placed in a high-stress evaluative scenario and asked to provide critical feedback to a performer varying in quality and affective state, allowing for the training and study of musical evaluation in a controlled setting.

Main contribution

The design comprised an adaptation of the Royal College of Music Performance Simulator, which consists of a darkened room with spotlights, stage curtains, backstage waiting area, and PC-controlled audio/video projection system. In "performance" mode, this screen displays a lifelike simulated audience, audition panel, or press conference for which a musician can perform. In "evaluation" mode, the performance is moved to the screen and the user becomes the evaluator. Recordings were made of an oboist entering the stage and playing a fast or slow excerpt of standard audition repertoire (Ravel or Tchaikovsky). For each excerpt, high and low quality performances were captured. The oboist was then asked to stand as if receiving feedback in three distinct settings, with his body language and facial expressions indicating (1) confidence, (2) frustration, or (3) mild tearfulness, after which he gave a "thank you" and walked from the stage with the same character. From this footage, custom software was developed to create a simulation in which the operator can call in the performer to play one of the two excerpts in the chosen quality, then trigger the selected feedback state to loop indefinitely while the participant is asked to give immediate critical feedback. The operator can then trigger the exit.

Implications

The evaluation simulator is being piloted as a research and training tool for musicians, allowing them to hone their skills as expert assessors while providing researchers the ability to study the evaluative act in a controlled setting. Applications across domains are also being examined.

Keywords

Acknowledgments

HOW DO EXPERT DANCE EDUCATORS CONCEPTUALIZE AND COMMUNICATE MUSICALITY?

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Background

Aesthetics, artistry, virtuosity, and musicality are all words that speak of the qualities we look for in dance performances. Musicality, while often mentioned, is a highly valued but complex and little understood idea. It is therefore not surprising that musicality is often at the center of critiques of dance performances, but it is more often characterized by its absence. It is difficult to find an adequate definition for musicality within dance. The demands for perfection combined with the qualities of musicality and expressiveness places pressure on training institutions in the process of preparing students for careers on the stage. The pedantic attention to technique that emerges can be at the expense of musicality.

Aims

This study presents an exploration of expert dance teachers' perceptions of musicality, asking how it is conceptualized and communicated to students. It considers musicality as a complex and ephemeral term that is difficult to describe. It presents problems for a teacher to communicate it to students in the process of preparing them for the rigorous demands of audition and performance. It is hoped that, through a study such as this, insight into how teachers perceive musicality and teach it may inform not only studio practices but also choreography sessions for developing dancers.

Method

Semi-structured interviews were carried out with three expert dance educators from elite ballet institutions in Australia, who have had successful dance careers and experience in choreography. The dance institutions chosen are highly regarded nationally and internationally. Using a qualitative, phenomenological research design, and Interpretative Phenomenological Analysis, overarching themes were revealed from the thick descriptions of the participants' lived experiences. As described by Reid, Flowers, and Larkin, phenomenological study offers "researchers an understanding of their thoughts, commitments and feelings through telling their own stories, in their own words, and in as much detail as possible."

Results

Interviews with participant dance educators revealed that musicality is a highly valued element of dance and an intrinsic part of performance. It is a complex trait that is made up of three interdependent components: rhythmic and physical accuracy with expressivity. These three components are qualified by the presence of passion and a consistent coordination and assimilation of music and movement. This is the key to the development of musicality. While these components were described, musicality was also characterized as being ephemeral, intangible, and a question that could not ultimately be answered.

Conclusions

Within this study, I have ventured into the discussion about how musicality is acquired and the apparent innateness of it, and how this can affect teachers' communication of this important concept. The complex nature of musicality presents problematic issues in communicating it to students. Participants expressed a belief that musicality is intrinsically part of their demonstrations of dance routines. When coupled with exercises built upon metaphors, musicality

is communicated adequately to all students. This pedagogical approach is problematic and raises questions about how to best prepare students for a career in elite dance performance.

Keywords

musicality; technique; dance; expressiveness; holistic

EMOTIONAL MCGURK EFFECTS ON MOTION AND AUDIO FOR PIANO PERFORMANCE

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Background

The McGurk effect was reported for voice hearing and sight senses, when people watch an audio-video stimulus with a voice of "ba" with a lip movement of "ga" they often perceive the voice as "da." In this way, the McGurk effect has been assumed to elicit "third perception," that was thought as to be appeared by the interaction of senses between audio and video. The studies investigated only for language and voice. Accordingly, the authors considered whether the phenomenon is occurred on musical performance.

Aims

The McGurk effect on emotional perception when watching musical performance (hereinafter called an "emotional McGurk effect") has discussed in terms of the possibility of existence.

Method

The authors discuss the existence of the emotional McGurk effect using visual and auditory stimuli for piano performances. Audio of piano performances portrayed some emotions were recorded with acoustic and MIDI signals. The body and the hand motions of the piano performances were also recorded using an optical motion capture system. The authors conduct the following three experiments to rate emotion for: (1) recorded, (2) stretched, and (3) combined stimuli. For (1), the recorded motions and audio are presented each by each to subjects who were asked to rate emotion, and if portrayed and rated emotions are homogeneous, the stimuli are employed to the experiment (2). The experiment (2) is designed to generate audio-visual stimuli by combining motion and audio on distinct emotion (sad motion with angry audio, for example). Since the timing of the motion and audio is not synchronized, time-stretching processing is employed to synchronize the motion and audio. The time-stretched stimuli are then rated by subjects. The stimuli rated as same in terms of emotion are then employed on the experiment (3). In experiment (3), motion and audio rated as distinct emotions are combined and used as experimental stimuli, that are presented to subjects who are asked to rate emotion.

Results

The authors confirmed the existence of the emotional McGurk effect when combining motion and audio with distinct emotion. Specifically, when combining the motion of "anger" and audio of "sadness," it was rated as "fear." According to the emotional two-dimensional space with allocation of the emotions by Juslin, the location of "fear" is between anger and sadness. Another finding from experimental (3) is that "anger" effects strongly the visual sense whereas "sadness" effects strongly on the hearing sense in piano performance.

Conclusions

An existence of the McGurk effect was confirmed by the evaluation experiment. Future work will confirm the emotional McGurk effect in other combinations of other musical performances.

Keywords

emotion evaluation; McGurk effect; piano; motion capture

Acknowledgments

Thematic session
Performance talk

AN EMPIRICAL STUDY OF NATIVE LANGUAGE INFLUENCE ON TROMBONE PERFORMANCE

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Background

The use of speech syllables in brass instrument pedagogy can be traced back to as early as 1584, and teachers have long used different consonants and vowel colors to illustrate how students should position their tongue to produce desirable sounds on brass instruments. Anecdotes of language influence on brass playing and challenges faced by players from certain language backgrounds have been discussed within the brass playing community. Furthermore, players of orchestral instruments often mention the existence of national schools/styles of playing that differ in terms of preferred tone quality, articulation etc. Positing an influence of native language speech production on brass instrument performance assumes an interaction of vocal tract and instrument bore resonances, which might influence timbre rather than determining the produced pitch. Further assumptions underlying assessments such as those listed above, however, have rarely been tested.

Aims

Collect empirical data of tongue positioning during speech production in a player's native language and while playing the trombone to determine whether there's an influence of the former on the latter.

Method

We used ultrasound imaging of the tongue to record midsagittal tongue contours of ten Tongan and ten New Zealand English (NZE)-speaking trombone players during speech production in their native language and while playing sustained notes on the trombone. For both speech and musical passages, simultaneous audio provided the basis for identifying individual ultrasound frames corresponding to vowel articulations and sustained note productions, and these were averaged for each participant using smoothing spline ANOVA. Finally, individual results were normalized (based on the estimated transducer location) and we calculated mean tongue shapes for the vowels and different notes on the language group level.

Results

Comparisons of the normalized and averaged tongue shapes employed during trombone playing show significant differences at the back the tongue that pattern with the back vowels in each language, while differences at the front of tongue might be related to different places of articulation used by the two groups of players. These observations suggest that motor memory of vowel tongue positions interacts with other constraints related to airflow, acoustical, and motor efficiency considerations to produce these differences.

Conclusions

We found significant differences between the tongue positions used by trombone players of two different language groups, providing evidence for cross-system interactions that enable the transfer of muscle synergies from one skilled vocal tract activity (speech production) to another (trombone playing). These findings support accounts of a modular organization of speech motor control, and are furthermore in accordance with reasoning and empirical evidence indicating that motor control is best regarded as a process of local, rather than global, optimization. A beginning brass player's vocal tract musculature faces the challenge of coming up with a way of initiating and channeling the required airflow into the instrument; assuming a vowel tongue position from one's native language, with subsequent local optimization, might provide the most cost-effective strategy in such a situation.

Keywords

language and music; brass instrument performance; ultrasound imaging of the tongue; cross-system interactions; modularity in motor control

Acknowledgments

OVERT AUDIENCE RESPONSES TO CONTEMPORARY DANCE: IS HAND AND BODY MOVEMENT A SIGNAL OF ENGAGEMENT?

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Background

Conventional seated audiences have relatively restricted opportunities for response. Perhaps the most salient is applause. However, they also use their hands and bodies to make other, visible, movements: to fix hair, adjust glasses, scratch ears, support their chin, or shift their body on the chair. The question we address here is whether these apparently incidental movements may provide systematic clues about their level of engagement with a performance. Our programmatic hypothesis is that audiences' ongoing responses are part of a bi-directional system of audience-performer communication that distinguishes live from recorded performance. What could performers be detecting in these situations that informs their dynamic sense of how well a performance is going?

Aims

The main aim of this research is to uncover these overt audience responses and test whether they provide a signal of audience engagement and thereby from part of a feedback cycle between the performers and their audience.

Method

We investigate this in the context of contemporary dance by capturing the responses of an audience to four performances by the London Contemporary Dance School. Video recordings of performers and audience were analyzed using computer vision and data analysis techniques extracting hand and body movement data. Each audience member wore a reflective wristband that allowed for automatic hand movement tracking, in this case by applying a blob detection algorithm to the video recordings. Audience movements were compared with the results of a survey of 21 participants who ranked the four dance pieces according to their quality.

Results

The results of this study indicate that overall audiences move very little during the performance. However, hands seem to play a significant role since they follow different movement patterns compared to the rest of the body; indeed, they are able to move more freely and might be detectable by the performers. In particular, we examine whether changes in hand and body movements are associated with audience preference for the four performances, as captured by the surveys. Looking at the mean speed of hands and body for each performance separately, the results show that they both move less during the most preferred dance pieces while their movement is more at the least preferred ones.

Conclusions

The results provide some initial clues to the importance of overt audience reactions, and especially visible hand movements. While the interaction between audience and performers is especially explicit in genres such as stand-up comedy, our study shows that it is still important, although more subtle, in genres like contemporary dance. The results of this study point to interesting open research questions regarding the interpretation of hand and body signals during a dance performance and their relation to audience engagement.

Keywords

audience; engagement; motion tracking; movement; contemporary dance

Acknowledgments

EXPLORING THE NONVERBAL BEHAVIORS OF PLAYERS IN A PARTICIPATORY MUSIC VIDEO GAME: A CASE STUDY OF MUSICAL PERFORMATIVE ACTS INVOLVING REAL AND VIRTUAL WORLDS

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Background

Previous research demonstrates how nonverbal behaviors in musical performance contexts in the real world reflect a range of cognitive, affective, and social processes. We extend that body of work on embodied processes in musical performative acts to include real and virtual worlds, through the context of a participatory music video game. Recent theoretical propositions argue that the embodied interactions players have with the game and its sound represent a communicative, performative act, involving a virtual audience. However, research has yet to examine how players embody socio-psychological and musical processes as they co-create a musical performative act within a participatory music video game.

Aims

The aim of this study is to explore how players in a popular participatory music video game embody socio-psychological and musical processes while co-creating a musical performative act involving real and virtual worlds.

Method

In an observational case study design, we employed nonverbal behavior analytical techniques used in previous research on solo and collaborative music making in rock, pop, and classical performance domains. The material for analysis was a YouTube video involving eight players, assigned to two four-piece bands, performing two songs each in the participatory music video game, Rock Band 4. The researchers independently analyzed the video material, then compared observations to arrive at agreed frequencies and categories.

Results

Players appeared to enjoy the affective experience and physical engagement with the game, and the opportunity to act out the "star" role. While performing a song, players' movements were constrained by the need to manipulate the controllers to achieve timing accuracy and win points in the game. Nonverbal behaviors demonstrated concentrated effort and attention to the screen. Little interactivity between players, or displays of affect or illustrative behaviors allied to the particular song, was observed. Coordinated behaviors between players were limited to rhythmic movement. On the whole, players demonstrated limited musical technique. However, players that appeared to be more expert, or who were performing the singing role, were able to indulge in a greater variety of nonverbal behaviors. The game context included avatar musicians and audience, as well as human players. However, interactivity between real and virtual worlds was primarily uni-directional–led by the game.

Conclusions

The results of this study suggest that the particular socio-psychological and musical processes embodied by players in a participatory music video game are different to those occurring in musical performative acts in the real world. Of course, players'/performers' nonverbal behaviors are shaped by different intentions (e.g. gameplay vs. expressive performance), and individual experience. Participatory musical games appear to provide a physically and affectively engaging medium for non-expert performers to have a shared musical performance experience. Although merely simulated, the musical performance experience appears to engage fundamental human affective mechanisms within a social context of shared musical meaning. A contemporary model of musical performative acts warrants inclusion of virtual and real-world contexts, professional and amateur participants, and emerging digital technologies and platforms.

Keywords

participatory music video games; musical performance; nonverbal behaviors; embodiment; nonverbal communication

Thematic session
Insights from voice, opera, and theater

AN EVALUATION OF THE BREATHING STRATEGIES AND MAXIMUM PHONATION TIME IN MUSICAL THEATER PERFORMERS DURING CONTROLLED PERFORMANCE TASKS

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Background

Breathing during exercise or dancing and singing involves much contrasting breathing patterns; tasks that musical theatre performers are expected to combine, with breath control for high phonation times, long notes or phrases, are especially challenging. Maximum Phonation Time (MPT) is a simple measure of respiratory and sound control, with a much-reduced MPT often regarded as indicating vocal dysfunction/laryngeal pathology. This unique study measures how exertion from dancing affects MPT in healthy subjects, and uniquely tests breathing during simultaneous singing and dancing.

Aims

The main aim was to find a method allowing investigation of the effects upon the respiratory system of various effortful tasks associated with musical theatre performance.

Method

Using a telemetric heart rate monitor, mask, and gas analyzer, 20 professional West End musical performers were tested while performing a 3min piece from their respective shows (*Singing in the Rain*, *Top Hat*, and *Wicked*), in which both singing and dancing were required continuously; repeated in three ways: (1) singing, (2) dancing separately, and (3) combined singing and dancing. In addition, measurements were taken of MPT and heart rate, both (1) standing still at rest and (2) directly after each performance task, and Vital Capacity at the beginning and at the end of the session.

A short questionnaire retrieved additional information about subjects' background, professional views, and experiences within this specific field.

Results

The differences in the levels of physical challenges for the selected performance pieces were minor, non-significant. Vital Capacity remained the same after dancing and singing as at rest. MPT reduced by 65.2%, from 20.4 seconds at rest, to 7.1 seconds directly after singing and dancing, at an average heart rate of 151bpm. Our study showed a clear statistically significant negative relationship between highly elevated heart rates and much reduced Maximum Phonation Time (MPT); with large individual variations and no linear correlation between our group's heart rates and MPTs. Tidal Volumes remained the same for dancing as during singing; while respiratory rates doubled. Minute Volume reduced by 16% but Relative Oxygen Uptake remained unchanged, despite increased heart rates when singing and dancing, compared with dancing only. Only 45% of the performers felt they were able to combine singing and dancing to their full potential by opening night.

Conclusions

Our method proved useful for studying aspects of singing and breathing under performance-like conditions with little negative impact upon normal dancing or singing presentation. Singing and dancing simultaneously will lead to compromises of both tasks, which may or may not be discernible to the observer. Questionnaire indicated little training in breathing outside singing classes and often too short rehearsal periods to achieve full potential. Further research is needed in how adaptations to teaching, training, preparations, rehearsals, etc. could help performers improving their ability to combine these contrasting tasks.

3D MOTION CAPTURE STUDY ON PERFORMING ARTS: A COMPARISON OF CHINESE OPERA PERFORMANCE MOVEMENTS

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Background

The difference of performance movements is a frequent reality for training Chinese opera performers. Many aspects of the acting training make performers particularly susceptible to being different with each other. Thus, the process of 3D motion capture could investigate the data of movements in between the instructor and students.

Aims

The purpose of this study focuses on a comparison of Chinese opera performance movements' difference for the professionals and students in the training place. For training issues, the "Eight Attributes" are the foundation of performing skills in Chinese opera. It concerns the manner of hands, eyes, head, feet, legs, and body, presenting the movements of a Chinese opera performer's physical capabilities. Therefore, the aim of this paper is directly towards one of three types of disciplines, which can be described as "Basic Exercises" (*Ji-ben-gong*). It is the most important foundation in the training for traditional Chinese Opera curriculum.

Method

For the methods, the researcher used PERCEPTION NEURON (motion capture equipment) for capturing the movements of the instructor and the participants. A Neuron houses an Inertial Measurement Unit (IMU), with a gyroscope, accelerometer, and magnetometer. The experimental processes used pre-experimental design in a one-shot case study. The subjects and conditions participated randomly and voluntarily. Furthermore, an electronic data analysis program was used to facilitate analysis. The main program used was SPSS 18, because of its versatility in statistical analysis. For the calculated methods, the bivariate correlation was used at a two-tailed significance level of 0.05 for comparison of the movements of instructor and participants, considering variables such as right hand, left hand, hips, right foot, and head. Motion capture was used to track the movements of an instructor and nine voluntary Chinese opera students as they performed a series of basic exercise movements. After a self-directed warm-up, subjects were given brief descriptions of each movement, and then asked to perform the movements. Thirty-one (31) IMU (Inertial Measurement Unit) markers on the whole body were used to track the movements of the subjects.

Results

The analysis looked at all the data from the captured movement and displayed all three values for each of the joints against each other of the three (x, y, z). A total correlation of right hand, left hand, hips, right foot, and head with velocity, acceleration, and angular velocity was seen in 2.5 seconds. The qualitative grades for nine subjects was given by the instructor and put in the table for comparison with quantitative results. The most important specific moment that Chinese opera performance called "liàng-xiàng" (posing) was shown in the figure as X and Y axis. The graphics indicated the differentials of the instructor and nine subjects. The short timing caparisoned minor changes of velocity, acceleration, and angular velocity in between 0.3 to 0.7 seconds. The spatial patterns showed a comparison between the same movements, done by both instructor and nine subjects. As the scatter showed, the patterns of right hand from each subject were different from the instructor. These dot-to-dot path tracking could easily see how different the movements of instructor and nine subjects were.

Conclusions

3D motion capture can be used for the future identification of detailed factors through a live demonstration involving visual blind spots and a rotating 3D doll perspective, to enhance the accuracy of movement observation. Analyzed data from 3D motion capture can benefit training. A database analysis can be applied to quantify and qualify cross-examination; individualized guidance can enable professionals and students to mitigate the problems of differences. Hopefully, the database of Chinese opera performance movements will be established and not only support teaching and learning in the real training field, but also have applications for VR (virtual reality), AR (augmented reality), and MR (mixed reality) in the near future.

Keywords

Chinese opera; teaching effectiveness; performance movements; 3D motion capture system; virtual assets

THE CONSTRUCTION OF MAPAS (MAPS OF AUDIOVISUAL PERFORMANCE) AND EDIPAS (AUDIOVISUAL PERFORMANCE SCORES) FOR THE ANALYSIS OF MUSIC VIDEOS

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Background

The analysis of music videos and sound spectrograms still misses analytical tools to examine its trinomial text-sound-image. I propose a combination of two consecutive analytical procedures to explain explicit and read-between-the-lines contents of moving images and spectrograms from music videos.

Aims

To provide the imagetic tools of MaPAs (Maps of Audiovisual Performance) and EdiPAs (Audiovisual Performance Scores) for the analysis of music videos.

Main contribution

Understanding the relationships among text, sound, and image of expressive and technical aspects of music performance as well as disclosing main and subjacent sibliminal musical discourses not readily perceived in text/context (such as music scores, lyrics, and background information) and sound (such as audio recordings) only.

Implications

Departing from the transcription of short excerpts of music videos or music spectrograms with relevant expressive or technical performance questions, MaPAs and EdiPAs are constructed to explain the performer's decisions and contributions in favor, against, and beyond music scores.

Keywords

analysis of music videos; text-sound-image trinomial; emotions and technique in music performance; construction of audiovisual performance maps; construction of audiovisual music scores

Acknowledgments

Thematic session
Aspects of practice

THE MULTIDIMENSIONALITY OF CONTEMPORARY MUSIC PRACTICE

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Background

Taking into consideration the new audio culture that emerged in the late 20th century calling attention to the potential of all sounds to be musical material, the phenomenon of interaction between instrumental and electroacoustic sounds became a fundamental point of interest of contemporary music. While the aesthetics of acoustics and electronic sounds are creating mutual influences, composers and sound designers develop new languages, new gestural attitudes, new extended techniques, new notation methods and inclusively new instrumental development. As a saxophonist, my musical orientation, since an early age, has been to be in close contact with contemporary music. The

last years of study led me to work closely with several composers and performers developing repertoire for my instrument and to deal with new mediums and systems for musical performance.

Aims

The aim of this paper is to analyze the developments of erudite new musical materials in a performative perspective, as well as to investigate the artistic implication of new aesthetics and gestural attitudes in the performance of contemporary music. This work documents perspectives of performance multidimensionality, identifying the various processes of musical expression in the field of new music including acoustic and electronic means, including the exploration of performative possibilities based on computer-mediation interaction and use of Augmented-Instruments.

Method

Due to the nature of the project, the methodological strategies used here were based on direct observation. This observation occurred during the study of the new pieces commissioned, while working with composers, and during the process of audio-visual recording. In complementarity to this study, opening future perspectives and developments, a series of interviews were conducted to other performers involved in the performance and premier of contemporary music pieces.

Results

New mediums are currently seen as possible extensions of instrumental practice and available for creative purposes during composition and performative processes. The possibilities of real-time sound manipulation offer possibilities of expressive expansion to any instrumentalist, just as they expand possibilities in the field of composition. This study shows that the performative gestures, associated with modern manipulation of the instruments, generating new virtuosic approaches in contemporary music, led to a mutual influence between acoustic and electronic pieces. It is suggested a framework of relations between augmented practice and extended practices.

Conclusions

As periods of research activity produce findings and artifacts that can then be mobilized in episodes of musical practice, we address several dimensions of multidimensionality in the erudite music performance domain. It is suggested a framework of relations between types of dimensions, which can both serve as a model for analysis, as well as provide composers and performers with pathways and strategies under these conditions. We conclude as well that traditional music instruments and digital technology, including new interfaces for music expression, are able to influence and interact mutually creating Augmented Performance environments.

Keywords

contemporary music; performance practice; sonic art; musical gesture

REHEARSING THE UNREHEARSED: ACQUIRING SKILLFUL ADAPTABILITY TO SUPPORT MUSICAL IMPROVISATION

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Background

Musical improvisation is a fascinating exemplar of the human ability to skillfully adapt existing expertise to new situations and continuously changing goals. As with any area of expertise, it is something that may be practiced and enhanced through training. However, by its transient and spontaneous nature, improvisation is difficult to conceptualize and empirically investigate from a cognitive science perspective. We advocate a scientific enquiry of musical improvisation based on principles from Ecological Dynamics theory. From this approach, the structures of practice and training which lead to more optimal stability and flexibility in improvised performance can be tested.

Ecological dynamics combines insights from Bernstein's theories of motor control and learning with Gibson's Ecological Approach to perception. Bernstein identified that movements are not performed identically across multiple repetitions, not even by experts, yet the goals of movements are consistently achieved. This is the result of goal-equivalent variability, whereby the many degrees of freedom of limb motion are coordinated such that variability is reduced along task parameter dimensions relevant to the desired outcome of the action. Gibson's Ecological Approach to perception begins with the premise that an agent's environment (including other individuals) is furnished

with opportunities for action—"affordances"—which its senses become attuned to through experience. Ecological dynamics combines these viewpoints: skilled performance involves coordinating goal-equivalent variability in movement with the pick-up of information specifying affordances. As a result, the skilled perception-action "system" can be both stable and flexible. That is, the agent can perceive and enact multiple ways to achieve goal outcomes. We believe that this approach can provide a starting point to scientifically investigate the acquisition of skills which support improvised musical performance.

Aims

The aims of this research are to develop and empirically test a framework of skillful adaptability, based on ecological dynamics theory, in the context of improvised musical performance. Using a novel musical interface, we will explore the parameters of practice that lead to more stable control of actions, and greater flexibility in coordinating these actions in subsequent improvised performance. We hope to build on this to better understand the processes by which improvisation skills are acquired.

Main contribution

The main contribution of this work will be to advance theoretical understanding of how acquisition of skillful adaptability can best be supported in musical training and other domains. We anticipate that by approaching musical improvisation from the theoretical standpoint of ecological dynamics, new directions for empirical investigation will be developed and new insights gained.

Implications

Advancing scientific understanding of musical improvisation as a skill should lead to new techniques for creating environments and practice approaches which better support acquisition of improvisation skills. Moreover, although improvisation has traditionally been conceptualized separately from musical performance based on pre-conceived material, even expert renditions of well-rehearsed musical pieces involve some degree of flexibility or novelty through the unfolding of performance. Hence, studying acquisition of skillful adaptability in the context of improvisation will also inform practices to enhance expressive skill in other musical performance domains.

Keywords

improvisation; skillful adaptability; ecological dynamics; music performance; practice

SEASONAL VARIATION IN VITAMIN D IN PROFESSIONAL BALLET DANCERS AT THE ROYAL BALLET, LONDON

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Background

Vitamin D is a hormone synthesized via sunlight exposure and through dietary sources such as oily fish and fortified foods. Its levels can be affected by sunlight exposure, geographical location, skin color, sunscreen, and certain medical conditions. Dancers may be at increased risk of vitamin D deficiency due to limited access to sunlight secondary to indoor training, performing, and competing and inadequate dietary sources of vitamin D. Vitamin D deficiency is associated with negative effects for athletes and dancers, including decreased physical performance, increased risk of stress fractures, impaired immune function, increased musculoskeletal pain, suboptimal muscle function, and increased risk of upper respiratory tract infections. Since 2011, professional ballet dancers at the Royal Ballet in London (latitude 51°N) have had serum 25(OH)D levels checked once yearly and are offered vitamin D supplementation according to the Royal Ballet vitamin D protocol. From 2015, the dancers were offered twice-yearly measurements of serum 25(OH)D.

Aims

The purpose of this study was to determine any seasonal variation in 25(OH)D levels in professional ballet dancers between spring and autumn, with the hypothesis that there would be a seasonal variation in serum 25(OH)D levels seen in the dancers with a drop in levels after the winter period.

Method

Fifty-six professional ballet dancers had serum 25(OH)D levels measured in September and April from September 2014 until April 2016. The dancers were supplemented with vitamin D according to the Royal Ballet vitamin D protocol, devised by experts in the field. The paired t-test was used to determine if there was a seasonal variation in 25(OH)D levels between spring and autumn.

Results

The mean serum 25(OH)D level ranged from 80.7 nmol/L to 100.4 nmol/L (within the normal range). There was no statistically significant variation in 25(OH)D levels between September 2014 and April 2015 (p=0.208). A statistically significant increase in serum 25(OH)D levels was noted between April and October 2015 (p=0.046) and between October 2015 and April 2016 (p=0.001).

Conclusions

The increase in serum 25(OH)D levels between April and October 2015 is in keeping with findings of similar studies which show higher serum 25(OH)D levels in summer compared to winter. The increase in 25(OH)D levels between October 2015 and April 2016 may be due to increased sunshine hours in March/April and increased awareness of skin exposure to sunshine in order to generate vitamin D. Dancers had been supplemented and this may mitigate seasonal variation in serum 25(OH)D levels even in winter. In spite of the seasonal variation seen, most dancers were replete in serum 25(OH)D throughout, likely due to the Royal Ballet's vitamin D protocol.

Keywords

vitamin D; season; variation; dancer; ballet

Workshops

ADAPTATION OF THE MINDFULNESS-ACCEPTANCE-COMMITMENT APPROACH FOR GROUPS OF ADOLESCENT MUSICIANS

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Background

Sports and music performance share many similar challenges. While much study has been undertaken in the field of sports psychology, the field of music performance psychology is less explored. This workshop aims to demonstrate the adaptation of a sports psychology intervention—the Mindfulness, Acceptance, and Commitment (MAC) Approach—to the domain of music performance for use with groups of adolescent musicians.

Music performance can be an exhilarating process, however many musicians experience severe anxious apprehension, known as *Music Performance Anxiety* (MPA). MPA often develops through early performance experiences, peaks in adolescence, and may continue into professional life. Musicians of all ages who report a higher level of engagement, peak performance, and flow in music are more likely to generate and sustain their motivation in engaging with the challenges of performance.

Aims

The MAC approach aims to develop strategies for preparation, practice, and performance that are intended to both reduce anxiety and improve positive performance outcomes. Rather than cognitive efforts to control, suppress, or eliminate unhelpful thoughts, the MAC approach advocates a strategy of acceptance, clarification of goals, development of increased commitment, and enhanced attention. The approach, based on an Acceptance Commitment Therapy (ACT) background, focuses on the interaction of instrumental, environmental, dispositional, and behavioral factors through pre-performance, performance, and post-performance response phases.

The full MAC program consists of seven sessions, each with a different focus, involving written exercises, practical activities, the development and application of mindfulness techniques, and discussion. The workshop will provide an

overview of the key points from each session with interactive demonstrations of some of the key exercises and activities that can support peak performance, and reduce performance related anxiety.

Main contribution

The adaptation of the MAC approach for use with groups of adolescent musicians was developed with the intention of presenting a practical and effective early-intervention program to assist young musicians manage the anxiety of performance, and to be able to perform well, regardless of internal or external circumstances. An experienced professional classical musician, trained in psychology, ACT, and the MAC approach, developed the adaptation. Results from the small pilot study of this approach have been promising, and the program is currently undergoing further development and assessment.

Implications

Recent studies from Australia and the United Kingdom have shown rates of anxiety and depression in performing artists to be significantly worse than the general population, with stresses of performing life considered to be a contributing factor. Higher MPA is also associated with general health issues, such as headaches, difficulty sleeping and eating, and higher levels of alcohol and drug use. Development of strategies for performing artists and musicians to use in order to manage the challenges of performance and assist them to perform at their best may assist in improving both their general well-being and mental health.

Keywords

music performance; performance anxiety; mindfulness; acceptance; commitment

Acknowledgments

DEVELOPING COMMUNITY WITHIN YOUR CHORAL ENSEMBLE

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Background

The Millennial generation poses a host of collaborative challenges for choral directors across the globe. Their world today is compartmentalized: a web-driven independence and a celebration of individuality, diminishing a need or desire for building tangible communities. The perceived desire for fewer personal relationships has led to gaps in collaboration—learning to work with others for a collective outcome. The traditional choral ensemble must accommodate these young musicians who wish to participate in good choral singing, but may lack the experience and understanding of their collaborative role within a group. It is essential for the choral director to recognize and adapt to future generations of choristers who celebrate individualism and struggle with cohesiveness. This now includes curating carefully selected group activities to nurture the future of choral music.

Aims

Collaboration in a traditional teacher-centered classroom will receive focus, building relationships with others through active engagement and discovering a sense of community within the choral ensemble. These methods have been developed to stimulate energy, engagement, and creativity among musicians, and appeal to a variety of student backgrounds (socio-economic, cultural, educational, etc.). Individual, partner, and large group (cooperative) activities, appealing to differentiated learners, will be explored. *Proprioceptive* (self-aware) singers within an ensemble will lead to stronger musicians and an aesthetically pleasing outcome.

Main contribution

Practical methods and demonstrations from a variety of methodologies (*mindful awareness*, Brene Brown, Phyllis Weikart, Carl Orff, and the American play party) will offer attendees strategies for building a sense of community within the choral ensemble and are ready for immediate implementation. The use of these methodologies fosters student participation, development of social skills, allows for emotional expression, and encourages the sharing of cultures through music and dance.

Implications

Decades of research in *team-building* for corporations and other business models have been conducted with the intended end-result of successful collaborative strategies. A similar philosophy and structure can be transferred to the choral ensemble to drive the value of singer accountability and build organizational loyalty. Creating a community through the use of non-singing activities allow students to become open and vulnerable in a safe environment. Vulnerability establishes trust, builds relationships, creates personal value, and allows students to collectively set goals as an ensemble with the guide of the choral director. Fostering student confidence void of arrogance is an essential part of choral excellence. The use of movement in a *team-building* manner strengthens singer engagement and accountability for successful choral outcomes.

Keywords

community; choir; movement; collaboration; engagement

Acknowledgments

MUSIC EDUCATION FOR INFANTS AND TODDLERS: AN INTRODUCTION TO THE ICELANDIC "TONAGULL" METHOD FOR FAMILY ORIENTED MUSIC COURSES

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Background

The method "Tonagull" has been implemented with parents and very young children in Iceland since 2004. The word "Tonagull" means tones of gold or playful tones, referring to the importance of playful approaches to music in early childhood.

Aims

The workshop will introduce the basic elements and pillars of the method applied in "Tonagull." The musical material of "Tonagull" will be used in the workshop encouraging participation in musical games using traditional Icelandic children's music and nursery rhymes. Participation of parents with infants will be encouraged in order to demonstrate young infants' ability to fully participate in age appropriate musical activities. Video demonstrations from early childhood music classes will further supplement the workshop.

Main contribution

The importance of using high quality material and professionalism in early childhood settings will be discussed. Research indicates that musical engagement has multiple benefits for families with infants and young children.

Implications

The research-based method of "Tonagull" builds on the most recent findings on musical abilities in early childhood and is constantly being improved and revised accordingly. Furthermore, the research conducted at the "Tonagull" music courses has provided valuable knowledge, published in peer reviewed journals, about successful and efficient practices in music engagement in groups with parents and very young children.

Keywords

musical participation; community music; early childhood music; Icelandic folk music; music pedagogy

BUILDING CONFIDENCE AND SELF-ESTEEM TOOLBOX WORKSHOP FOR ARTISTS

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Background

The world of performing and creative artists is fraught with tension related to constant criticism from instructors, managers, peers, and their own inner critic, as well as financial insecurity and the often-underlying belief that perfection is a realistic goal. As interdisciplinary collaborative health care practitioners in a unique facility treating only artists, we have observed that underlying many of our patients' health conditions is stress, anxiety, and poor self-esteem. These conditions negatively impact the artists' ability to train, work, create, and perform. Working with the hypothesis that a healthy self-esteem positively impacts the ability of artists to not only better deal with stress but also to be able to better perform and create, a workshop entitled "Building Confidence and Self-esteem Toolbox Workshop for Artists" was designed. The model for the workshop is to take the participant on an experiential transformative journey. A base reference point of how each participant views their self-esteem is established at the beginning by a self-reflective exercise. During the six-hour workshop, intrinsic and extrinsic contributing factors to self-esteem are explored through a combination of introspective exercises, creative visualization, partner work, and ritual. By including physical and sensory involvement the learning is encoded and allows for change on a deep level. The last exercise is to again reflect on what has changed. Condensed versions of this workshop have been held at Performing Arts Medicine Association and Healthy Dancer Canada conferences in Toronto, Canada.

Aims

The aim of this workshop is to provide a condensed experience of the full "Building Confidence and Self-esteem Toolbox Workshop" so that attitude, approach, and self-esteem can improve. The full workshop includes: check-in to establish base line reference point of self-esteem; becoming aware of and challenging current beliefs, assumptions, and perceptions; discovering and managing personal obstacles to attaining a positive self-image; experiential exercises to clear negative beliefs and embrace positive changes; check-in to monitor changes.

Main contribution

Participants will experience a positive shift in their self-esteem. They will have had an experience of being able to change internal thought processes and clear obstructions to their creative process and performance. They will also gain tools that can be applied to themselves and people with whom they work, and that can become part of their process for creating, developing, and performing.

Implications

This workshop can positively affect the attitude of all participants in creative endeavors. It can help separate the art from the artist that allows more freedom to explore and create. It can be adapted as a model for creative and performance processes. The effectiveness of this workshop has been assessed in a small research study that has been submitted as the focus of another presentation at this conference.

Keywords

workshop; process; self-esteem; transformation; performance

PRACTICE METHODOLOGY: A POWERFUL TOOL IN MUSIC PERFORMANCE EDUCATION

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Background

Many established psychological theories of musical ability and standard pedagogical practice equally tend to fail to address the fact that a performer is not only expressing but also *empathizing* with feelings and that performances occur *in real time*. However, these attributes are the key qualities of a musical performance to be accounted for in the theory and pedagogy of performance, as well as in theories of musical ability.

Aims

My model of the performer's phenomenological processes focuses on performers' real-time cognitive and affective processing during a performance. In my workshop, I intend to show how this model can be introduced into pedagogical practice: a short presentation of the model and a new methodology of music performance pedagogy (*Practice Methodology*), based on this model, will be followed by a demonstration of the Methodology.

Main contribution

I argue that a key sign of musical giftedness is the ability to extract "meanings," grounded in feelings, from musical materials, and to fully concentrate on them in the act of performing. Full concentration is fostered through the ability to cognitively "navigate" in the musical flow, i.e. to be able to position into the future, the past, and the present during performance. This ability, which is likely to rely on a more general empathic ability, can be mastered by the majority of people, including those scoring low on standard musical aptitude tests measuring "melodic," "rhythmic," or "harmonic" skills. In the workshop, I present the outline of my *Practice Methodology*, based on the cognitive/attentional processes delineated above, which aims at enhancing in musicians (regardless of their instrument and including singers) the ability of real-time navigation in the musical process. This consists of the following sub-abilities: (1) the ability to form a clear cognitive and affective map of forthcoming structural units (i.e. to anticipate the character and duration of the forthcoming—usually hierarchically embedded—structural units through feeling their length and character); (2) to form a clear mental image of the preceding musical units to which the subsequent ones are to be measured; and (3) to deeply feel the present moment. The outline of the Methodology will be followed by a demonstration of some of its key exercise types.

Implications

Practice Methodology was developed during the past decade and has already been introduced at the tertiary level education in several institutions in Hungary, as well as at masterclasses in five European countries. Based on initial evidence from primary and secondary level pedagogy, further to the conservatoire level, the Methodology can be used with singular success from the very beginning up to the most advanced levels of music education, yielding a uniquely powerful tool in music performance pedagogy.

Keywords

phenomenology of music performance; attentional processes; empathy; performance education; *Practice Methodology*

USING MUSIC PERFORMANCE TO TEACH UNIVERSAL SKILLS IN NON-MUSIC DISCIPLINES: A NEW PEDAGOGY FOR THE 21ST CENTURY

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Background

Music has long been thought of as entertainment. However, music can also be used to teach universal skills and concepts valued by non-music disciplines. Specifically, live music performance can be highly effective in demonstrating the steps used in employing these skills and concepts by showing how they work as a process.

Aims

The goal is to demonstrate, using live music via the piano keyboard, how these universal skills and concepts can be taught using a specific method. Additionally, the aim is to show how live performance can introduce and teach universal skills and concepts in ways words alone cannot.

Four skills/concepts will be demonstrated: creativity, communication, problem-solving, and practice. First, steps in each skill will be defined through word; second, steps in each skill will be illustrated as a process through music performance; third, through transference, interdisciplinary application will be made (seeing the skill in operation outside the field of music).

Main contribution

This presenter hopes to broaden the educational application of music performance to include using it to effectively teach and illustrate skills and concepts to a wide range of disciplines in schools and the workplace.

Implications

Could using music to teach universal skills and concepts for a wide range of inter-disciplinary applications become a new field in music education? Because music naturally engages listeners' attention, could the use of music performance to illustrate and demonstrate skills and concepts become more mainstream in training programs and schools where universal skills are taught?

Keywords

performance; teaching; method; pedagogy; inter-disciplinary

Graduate award paper

MIND THE MIND: A PROFILE OF MENTAL HEALTH IN THE PERFORMING ARTS

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Background

The World Health Organization's (WHO) definition of health remains a reference in studies on wellbeing. However, its main principle of health as "more than the absence of disorder" is rarely followed. When looking at research with performing artists this is also true: assessment tends to focus on performance anxiety, depression, and stress. If the WHO's standards are to be taken seriously, mental health assessment needs to measure positive, and not only negative, components of functioning. Furthermore, there are now three established threads of research that have shifted mental health profiling, highlighting that: (1) mental health is multidimensional; (2) positive and negative functioning are not merely ends of the same continuum but represent two different continua, only moderately correlated; and (3) mental health is linked with specific positive traits (character strengths) and one's daily opportunities to use them. The performing arts are still to benefit from this epistemological rigor that is starting to shape the field of mental health research.

Aims

The purpose of the current study was to generate a large-scale profile of performing artists' mental health, exploring: (1) performing artists' mental health status, when considering mental health as multidimensional positive functioning; (2) the relationship between positive and negative functioning; and (3) performing artists' top character strengths.

Method

Over a period of one year, a battery of 4 standardized questionnaires covering multidimensional wellbeing and character strengths was distributed to performing artists through orchestras, opera houses, choirs, dance companies, theatre companies, conservatoires, ensembles, and via online forums. Both professionals and higher education students in performing-oriented programs were included. The battery included the following measures: (1) Mental Health Continuum Scale (Long Form); (2) Kessler Psychological Distress Scale; (3) SF-36 Health Survey; and (4) VIA Inventory of Strengths. A total of 1098 performing artists from 51 countries participated (69% female, 31% male), spanning across music (n=870), dance (n=123), and theatre (n=105). 49% reported performance as their source of income, while the remaining maintain portfolio careers. Analysis was carried out making use of SPSS software.

Results

Results point to: (1) performing artists' mental health status as either higher or not significantly different from the general population for the majority of the 13 assessed dimensions of mental health; (2) confirmation of the dual-continuum model of mental health in the performing arts; and (3) specific character strength profiles within each domain of activity (music, dance, and theatre).

Conclusions

Mental health represents the presence of positive indicators of functioning, not just the absence of negative ones. Performing artists' profiles of mental health and its predictors (such as character strengths) deserve close attention

in relation to the optimization of interventions and psychological health promotion strategies to enable effective processes and sustainable products of performance.

Keywords

mental health; character strengths; positive psychology; performing arts

Symposium
Musical Impact II & III

THE PHYSIOLOGICAL DEMANDS OF PERFORMANCE: PIANO AND CONTEMPORARY DANCE

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Background

Musicians and dancers are often referred to as artist-athletes, yet the physical demands of their art forms are largely unknown. While a few studies have measured muscle activation during specific movements among certain instrumentalist groups, little is known regarding musicians' energy expenditure while playing different pieces of repertoire. In dance, attempts have been made to examine the physiological demands of contemporary and ballet dance, however findings are far from conclusive. This presentation draws upon the findings of two separate studies, which investigated the physical demands of music and dance. Such information will be useful for those responsible for training performing artists to help them meet the physical demands of their profession.

Aims

By considering the findings of two studies, the energy demands of different piano and contemporary dance repertoire will be discussed alongside a critical appraisal of the methods and rationale for evaluating music and dance in this way.

Method

Postgraduate and professional pianists and full time conservatoire contemporary dance students volunteered to undertake a maximal oxygen uptake (VO2) treadmill test before performing music or dance repertoire, which was familiar to them. Participants wore a portable gas analyzer for all tests. Variables measured included heart rate, oxygen uptake and Kcal. Activity intensity was determined by the participants' percentage of their VO2 max scores obtained from the treadmill tests.

Results

The performed pieces, regardless of whether they were music or dance pieces, differed in terms of their demand as calculated relative to individual maximal capacities and this was the case for all participants. The Chopin *Prelude No. 13 in F#* and Chopin *Etude Op. 10, No. 12 "Revolutionary"* were played on average at 12.7% and 21.8% of participants' maximum capacities. The highest intensity points for each piece relative to the participants' maximum were 19.1% and 30.3% while the dance data show a peak range from 86.93% to 106.66% relative to the participants' maximum capacities. The physical fitness of the participants as well as their high level of skill are possible contributing factors.

Conclusions

Piano playing and contemporary dance are intermittent activities with regard to intensity and variation exists both between and within pieces. These findings may help educators of musicians and dancers to prepare more effectively for the varying physiological demands of their art forms.

Keywords

dance; fitness; specificity; testing; physiology

EFFECTS OF MUSICAL PERFORMANCE ON THE PHYSICAL DEMANDS OF VIOLIN PLAYING: A BIOMECHANICAL ANALYSIS USING SURFACE ELECTROMYOGRAPHY

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Background

Music Performance Anxiety (MPA) is a debilitating condition representing an immense burden within the musical profession and has potentially devastating effects on the health and wellbeing of musicians. Large-scale international studies of orchestral musicians show it is the most common medical problem related to playing within this population, with up to 70% suffering from MPA severe enough to affect their performance, with symptoms including increased heart rate, hand sweating, muscle tension, trembling, and shaking.

Aims

The aim of this study is to investigate the effects of the physiological responses to musical performance and MPA on the physical demands of violin performance as represented by muscle function using surface electromyography.

Method

Participants are undergraduate and postgraduate violinists studying at London-based music conservatoires. Each performs two contrasting movements from Bach's *Six Sonatas* and *Partitas for Violin Solo* (selected as it is unaccompanied, familiar to all violinists, and frequently performed in recitals and auditions) under two conditions: (1) a simulated audition using the Royal College of Music Performance Simulator (a unique facility designed to realistically recreate the experience of a public recital or audition) and (2) a low-stress playing environment (acts as an experimental control to which the effects of musical performance on muscle activity can be compared). Physiological and psychological stress in response to the simulated performance are measured respectively via heart rate monitoring and completion of the State-Trait Anxiety Inventory (assesses anxiety in response to performance and natural predisposition to anxiety). The activity of 13 muscles in the right and left upper limbs is measured using the non-invasive technique of surface electromyography and the playing sessions undergo audio-visual recording synchronized to these measurements to facilitate accurate data analysis.

Results

This presentation will report results in three participants regarding the level (as a percentage of the participant's maximal voluntary isometric contraction) and characteristics (in terms of the degree of antagonist contraction in opposing muscle pairs, including biceps/triceps, flexor carpi ulnaris/extensor digitorum, flexor digitorum superficialis/extensor digitorum) of muscle activity, reflecting those of previous related studies in pianists which have revealed that performing under experimentally-induced psychological stress and in a mock competition with a live audience leads to increased mean electromyography amplitudes and co-contraction of agonist-antagonist muscle pairs, as well as elevated heart rate and state anxiety.

Conclusions

This is the first study to measure the effects of musical performance on muscle function in violinists and to do so within the reliable and reproducible experimental environment of a performance simulator. The results obtained are therefore critical to enhancing our understanding of the physical demands involved in high-stress musical performance. As instrumental playing is a highly skilled activity requiring great precision and fine motor control, these demands can have a profound impact on the ability of musicians to perform optimally and may lead to the development of musculoskeletal injury.

Keywords

orchestra; strings; injury; pain; prevention

Acknowledgments

TRENDS IN MUSIC PERFORMANCE STUDENTS' WELLBEING SINCE 2000

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Background

There is growing concern for the health of students in higher education. As professional musicians in training, many music students face additional problems. While there is a body of research on the prevalence of MPA and PRMDs in student musicians, for example, the full range of issues they experience, both psychological and in relation to their physical health, remains to be explored. One resource that came to our attention early in the development of the health promotion course described in Paper 1 of this symposium is a database of (student self-) referrals maintained by counselors at one UK conservatoire since 2000.

Aims

The aim of the study was to analyze the information in the database so as to identify issues of concern to students and explore potential trends in their wellbeing over time, and to seek comparator data from at least one other institution to contextualize the information in the database.

Method

Ethical approval was sought and granted by the CUK Research Ethics Committee. Anonymous data for 665 students were obtained from written records dating from 2000, entered into, and analyzed using SPSS. Information included year of referral; date of birth; sex; nationality; school, program and year of study; number of sessions attended; and presenting and emerging problems. These were labeled by the counselors, according to the list of 280 specific health issues and their variants (ranging from academic and occupational stress to abuse, self-harm, personality disorders and issues related to cultural identity, pregnancy, and finances) provided by the Association of University and College Counsellors, a division of the British Association for Counselling and Psychotherapy. The intensity of each issue was scored on a range from "Experiencing normal issues of living, mood stable, functioning well" (0) to "Not coping; out of control; despair; emotionally overwhelmed; suicidal thoughts/intent" (7). Comparator data from a second UK conservatoire were identified.

Results

Preliminary analyses of the database revealed a year-on-year increase from 14 referrals in 2000-2001 to 78 in 2014-2015. The majority of students were undergraduates (71%), female (63%), and British (79%), divided between string players (29%), wind, brass and percussion players (28%), singers (26%), and keyboard players (10%). They attended from one to 130 sessions (M=7.6; Mo=1). The most frequently-reported reasons for attending the first session related to self-esteem, self-confidence, ego strength, and coping ability; relationships with family, partner, and others including members of staff; and general anxiety and music performance anxiety. Other emerging issues included personal growth, search for values, and meaning; lack of academic motivation or ability to concentrate; and procrastination and persecution, bullying, harassment, or stalking. In terms of their intensity, presenting problems were causing sufficient distress to affect multiple areas of functioning (M=4). In the paper, these results are set in context by reference to the available comparator data.

Conclusions

The database provides valuable information as to the main issues of concern to several generations of music performance students at a UK conservatoire, over time. Reference to comparator data indicates the degree to which these may be typical of UK conservatoires more generally. The emerging issues will be explored further (e.g. by instrument and voice) and could inform potential intervention studies. It would also be useful to consider follow-up in terms of referral onward to other professionals, such was the intensity of some presenting problems.

Keywords

conservatoire; counseling service; referrals

HEALTH AND WELLBEING FOR MUSICIANS: COURSE DEVELOPMENT

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Background

A systematic review of the relatively scarce literature reporting relevant health promotion programs revealed a wide variety of course content and a number of methodological limitations. Similarly, the intervention studies for MPA and/or PRMDs also included in the review varied in their approaches, effectiveness, and methodological rigor. The Health Promotion in Schools of Music project recommended that conservatoires should adopt a health promotion framework; deliver occupational health courses for all undergraduate students; educate them about hearing loss; and help them engage actively with health care resources. On the basis of the literature, advice from members of the Healthy Conservatoires Network (UK) and others who attended seminars we had organized on health psychology and musicians' health, the evidence presented in Paper 2 of this symposium, and the HPSM recommendations, we designed and implemented such a course. We report its evaluation in Paper 3.

Aims

The aim was to make use of the opportunity provided by the revalidation of the BMus program at the RNCM, from September 2016, to enhance awareness of, and respond to potential challenges to the health and wellbeing of first year undergraduate students by delivering a health promotion course as part of the core curriculum.

Main contribution

The course was designed, by necessity, in collaboration with members of staff at the RNCM, principally the acting heads of undergraduate studies and the heads of the instrumental and vocal schools of study. It forms part of a larger module, Artist Development 1. The content of the course was determined by our critical appraisal of the available literature, supported by the advice and the resources specified above, within the constraints of the conservatoire timetable and the availability of staff to deliver the course. It consists of seven one-hour lectures for the whole first-year cohort in Terms 1 and 2, and five one-hour seminar/workshops in Term 2. Presenters and facilitators included the authors, senior staff in the schools of strings, chamber music, and vocal studies, and a specialist in performing arts medicine; all are performers themselves. Lectures addressed strategies for individual practice and ensemble rehearsal; information on what is currently known about musicians' health and wellbeing (including hearing impairment, MPA, PRMDs, and stress); life skills for musicians and behavior change techniques; anatomy and physiology; music performance anxiety; and performance/presentation skills. Seminar/workshops taught behavior change techniques based on the latest research findings, intended to provide the students with practical tools for behavior change in all the domains addressed by the course; postural control and sensorimotor integration; injury prevention and management including hearing protection; preparation for performance including practicing and memorizing; and managing time, finance, and life on tour.

Implications

Evidence from research has much to offer the development of health promotion courses, and in this part of the project we attempted to integrate not only the findings of previous research in music education and performance but also the findings and approaches of research in the behavioral sciences and health psychology. In this way we hope to help students to bridge the gap between knowledge/intention and action.

Keywords

HEALTH AND WELLBEING FOR MUSICIANS: COURSE EVALUATION

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Background

In our systematic review of health promotion programmes and intervention studies we identified methodological limitations including the incorporation of non-evidence-based elements and the use of unvalidated questionnaires as evaluation tools. The research was undertaken in an attempt to address these limitations, and also to introduce and assess the effectiveness of behavior change techniques applicable equally to health-related behaviors, time management, and practice and rehearsing.

Aims

The evaluation was designed to obtain students' feedback on the course and to measure potential changes in their attitudes and behaviors over the six months that it lasted.

Method

Ethical approval was sought and granted from the RNCM Research Ethics Committee to carry out a questionnaire survey with first-year students. Baseline data were obtained at the start of the course and the same questionnaire was administered at the end, as part of the students' assessment. Items included demographics, health-related quality of life (EQ-5D; 15D), positive and negative emotions (PANAS), PRMDs (pain frequency and intensity and perceived exertion via the Rating of Perceived Exertion (RPE) scale), perceived stress (PSS), health-promoting behaviors (HPLP II), self-efficacy (SES), work patterns, hearing loss and use of hearing protection, as well as perceived knowledge, competency, awareness, responsibility, and attitudes towards health and wellbeing. Interview data were obtained from 20 students when the questionnaire data had been analyzed.

Results

At baseline, 90 students who completed the questionnaires (46% male, 52% female), 13% reported moderate problems with sleeping, 11% felt moderately sad, melancholic, or depressed, 9% felt moderately weary, tired, or feeble; 5% reported hearing normal speech with a little difficulty, 8% reported having tinnitus and 6% reported hyperacusis. The severity of PRMDs was surprisingly low (M=2.23 out of 10). Our results confirmed previous findings in that respondents showed lower scores for health responsibility, physical activity, and stress management than nutrition, spiritual growth, and interpersonal relations. In addition, perceived stress was negatively correlated with self-efficacy, positive affect, and health-promoting lifestyle. Self-efficacy was negatively correlated with perceived stress and positively correlated with positive affect and health-enhancing behaviors. Sleeping problems were correlated with affect (negatively with positive affect and positively with negative affect), positively with perceived stress, depression, distress, and lack of vitality, and negatively with self-efficacy. After two terms, positive affect had decreased. Students reported significant increases in their perceived awareness of risk factors for PRMDs, and significant increases in their perceived knowledge of effective strategies for practicing, learning, and memorizing; rehearsing; ergonomics and posture; management of music performance anxiety; life skills and behavior change techniques; resources for healthy music-making; and sound intensity levels associated with hearing loss. Interview data suggested that students had made changes to their behaviors and implemented some of the techniques they had learned in the workshops on life skills in their practice and rehearsal; they listed the sessions they found most useful and made valuable suggestions for modifications to the course that will be put into practice in 2017-2018.

Conclusions

This is one of the very few evidence-based health promotion courses for music students that have been evaluated to date. Quantitative and qualitative analyses of data have provided useful information with respect to both patterns in changes related to relevant outcomes, and students' perceptions of and suggestions for the course to inform future improvements.

Keywords

conservatoire; health promotion; music students

TOWARDS A CONCEPTUAL FRAMEWORK FOR RESILIENCE RESEARCH IN MUSIC TRAINING AND PERFORMANCE: A CROSS-DISCIPLINE REVIEW

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Background

Resilience has become an increasingly ubiquitous term during recent decades, resulting in a prolific and eclectic body of literature. The purpose of this paper is to explore both classical and modern conceptions of resilience, with a view establishing to what extent the general concept of resilience might be applied to training within an artistic discipline such as music. Little existing research currently addresses directly how the high degrees of occupational stress routinely faced by musicians might impact upon their capacity to maintain either psychological or physical resilience, or how these stresses might realistically be mitigated.

Aims

Drawing on conceptions of resilience and critical arguments from fields of study as diverse as social ecology, sociology, anthropology, sport, and political economy, I aim to define resilience in a way that might carry meaning for the musician practitioner. Following this and in line with current thinking in social theory, I offer cautions regarding over-reliance on standard approaches to resilience at the expense of more creative and productive responses to management of adversity and trauma. I suggest that the emotional and psycho-social factors that characterize music performance might, in some ways, place it beyond any one line of resilience thinking. The balance between stabilizing and destabilizing forces appears to be critical to survival and since musicians are commonly faced with unpredictable environmental, artistic, and personal "destabilising forces." I also explore the relevance of this critical aspect of resilience thinking.

Main contribution

I identify personal and environmental characteristics that enable resilience in musicians. I also suggest alternative approaches to educational practice that go beyond the current widespread practice of training the "entrepreneurial musician" as a way to develop resilience. My contention is that it might be more productive if musicians are encouraged to develop as "artistic entrepreneurs"—that is, to take the concept of creative entrepreneurial thinking directly into their instrumental/vocal learning and performance; innovative thinking, experimenting, discovery, risk taking, and improvising, but with the goal of developing the uniqueness of the individual. It should also be noted that the will to persist in the face of adversity can easily lead to the opposite of sustainability, with injury or mental disorder; characteristics that enable resilience (such as drive and risk-taking) can both help and hinder the capacity for resilience.

Implications

I conclude that although inherent physical and psychological characteristics play a part in developing the capacity for resilience, the quality and quantity of developmental opportunities and support, although significant factors in career longevity, are not apparent in all successful musicians. The life world of the musician is a variable emerging from a driven emotional and physical engagement with music that is impossible to describe or quantify in any holistically meaningful way. This strength of conviction can be the driver of the struggle that allows environmental disadvantages to be overcome. This implies that acquiring and maintaining resilience is an evolving process, heavily dependent on individual characteristics and circumstances; extrinsic interventions therefore need to be carefully tailored for the individual musician, with the emphasis on self-awareness.

Keywords

resilience; performance; creativity; risk; vulnerability

Acknowledgments

Thematic session
Performance demands I

IS MUSIC PERFORMANCE ANXIETY RELATED TO SOCIAL ANXIETY DISORDER?

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Background

Little is known about the causes of music performance anxiety (MPA), even though it is a serious obstacle to music performance. It has been suggested that MPA may be related to social anxiety disorder (SAD) but the nature of the relationship remains unclear. Is only the performance component of SAD associated with MPA or is the social interaction component also implicated? It is crucial to investigate these relationships, because SAD includes a qualitatively distinct performance subtype in DSM-5, based on research on the relationship between speech anxiety and SAD. Yet, little is known about whether the relationship also applies to MPA, even though DSM-5 states that this performance subtype also applies to musicians. Treatments of SAD are better developed than those of MPA. Knowledge of the relationship between MPA and SAD could thus help in diagnosing the syndrome and developing treatment options for MPA.

Aims

The purpose of the present study was to investigate the relationship between MPA and SAD and explore the relative roles of the performance and social interaction subtypes of SAD in MPA. If the correlation between MPA and the performance subscale is high, and the relationship between the interaction subscale and MPA is low, MPA should possibly be regarded as a performance subtype of SAD. However, if there is a low correlation between MPA and SAD, MPA should possibly be regarded as a distinct disorder, or a subtype of another disorder.

Method

Fifty-five music students were asked to fill out two questionnaires: the Kenny Music Performance Anxiety Inventory and the Liebowitz Social Anxiety Scale. Pearson correlation coefficients were calculated to determine if there were significant relationships between MPA and SAD (both between the subscale performance anxiety and MPA and subscale social interaction and MPA).

Results

The results showed that MPA and SAD were positively correlated ($r=0.49$). As expected, there was a positive relationship between MPA and the performance subscale ($r=0.46$). However, there was also a significant relationship between MPA and the social interaction subscale ($r=0.40$), contrary to expectations.

Conclusions

If the results of this study are correct, if there is no difference between the interaction and performance subscales, it may be more desirable to not categorize MPA as a subtype of SAD, at least not the performance subtype that exists in DSM-5. Even though MPA should probably be considered in isolation, knowing that the relationship between SAD and MPA is strong is beneficial in view of possible treatment options. Further research into these relationships is needed to establish if these conclusions are valid.

Keywords

music; performance anxiety; social anxiety disorder

WHAT LIES BENEATH: THE ROLE OF PARENTING STYLE IN MUSIC PERFORMANCE ANXIETY AND ITS RELATION TO ATTACHMENT BEHAVIOR AND OTHER ANXIETY-RELATED SYMPTOMS

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Background

Music performance anxiety (MPA) is often considered as a form of social anxiety. Moreover, its correlation with parenting style and attachment behavior is often discussed in literature: It is assumed that individuals who experienced an adverse parenting style develop poorer self-concepts and less autonomy. In addition, previous research illustrates that these individuals report more anxious behavior. Hence, scientists argue parenting style might be associated with MPA. However, it remains unclear how attachment behavior might moderate this relationship.

Aims

The aim of this study is to examine the extent to which retrospectively perceived indifferences, abuse, or over-control in the parent-child bonding or attachment behavior relate to MPA. Furthermore, this study aims to systematically assess anxiety-related symptoms and its association with MPA.

Method

Subjects (N=76, 68.4% women) were music students (M=23.57 years, SD=3.41) recruited by online link distribution in different music colleges and universities in Germany. MPA was measured using a performance-related sub-score (24 items) as well as the total summary score of the German version of the Kenny Music Performance Anxiety Inventory (KMPAI). Perceived parenting style was measured by retrospective self-report using the German version of the Measure of Parenting Style (MOPS) with sub-scales for indifference, abuse, and over-control for mother and father respectively. Assessment of attachment behavior was based on Bartholomew's four-category model, measuring secure, dismissing, anxious, and preoccupied attachment behavior. General or specific anxiety-related and depressive symptoms were assessed using the Disorder-Specific Severity Measures of the DSM-5. For data analyses, the approach of partial and canonical correlation was applied to set up a multi-dimensional model, examining the relationship between parenting styles, attachment behavior, and MPA as well as MPA and other anxiety-related symptoms or disorders.

Results

The majority of participants were vocal (27.6%), string (23.7%) or keyboard (17.1%) students having about 20 performance opportunities per year each. Both parenting style and attachment behavior correlated to total summary score of the KMPAI (r=0.47, p=0.01 and r=0.44, p=0.004 respectively). Using performance-related sub-scores only showed a non-significant correlation with MPA (r=0.36, p=n.s. and r=0.33, p=n.s. respectively). Adjusting the relationship through canonical correlation, using a three-dimensional model, showed that the dependence between parenting style and MPA is not solely explained by attachment behavior as mediating variable. Results also indicated differences in the relationship for parental styles' sub-scales by mother compared to father. Further analyses indicated MPA is most strongly correlated with generalized anxiety disorder (GAD; r=0.53, p<0.0001) and social anxiety disorder (SAD; r=0.44, p<0.0001). However, several multivariate analyses techniques showed that GAD is fully sufficient for predicting MPA scores.

Conclusions

In summary, the influence of parenting style on MPA appears not very strong. The same applies to attachment behavior. Furthermore, multivariate analyses suggest MPA may be regarded as its own anxiety type rather than being linked to specific anxiety disorders. While MPA is somewhat linked to SAD, these results do not support the hypothesis that MPA is foremost a social phobia.

Keywords

KMPAI; MPA; parenting style; attachment behavior; anxiety

SOCIAL SUPPORT FOR PERFORMANCE ANXIETY: INFLUENCES FROM FRIENDS, PARENTS, AND TEACHERS

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Background

Music performance anxiety (MPA) is often a serious problem as it decreases the quality of music performances, causing musicians both physical and psychological stress. It has been reported that 63.9% of classical musicians were distressed by MPA. Recent studies indicate that there are substantial individual differences in the extent to which musicians and their performances are influenced by MPA. Since each stage of long-term musical training involves various individuals in musicians' support networks, this study investigated how their psychological support affects musicians' MPA.

Aims

This study aimed to examine the relationships amongst student musicians' perceptions towards MPA, the quality of music performance, and perceived psychological support from friends, parents and teachers.

Method

Forty-four university students (UG and PG) majoring in music (Male=7, Female=37; M=21.2 years old) participated in a questionnaire survey. Participants were asked to recall the most important public performance in the past 6 months, and then to complete the following five questionnaires: (1) Psychological and physical states just before the performance, adapted from the Revised Competitive State Anxiety Inventory-2 (CSAI-2R); (2) The quality of the performance, a performance evaluation scale with 10 items developed by Yoshie and colleagues; (3) Support from music teachers, a social support scale with 9 items developed by Ryan and colleagues and 9 additional items based on our preliminary survey; (4) Parental support, a social support scale with 12 items developed by Ryan and colleagues and 3 additional items based on our preliminary survey; and (5) Support from family, friends, and the significant other via the Multidimensional Scale of Perceived Social Support.

Results

Both cognitive anxiety and somatic anxiety just before an important performance, measured by the CSAI-2R, were significantly and negatively correlated with performance quality (r=-0.39, p=0.009; r=-0.42, p=0.005). In relation to social support, self-confidence just before a performance, measured by the CSAI-2R, was significantly and positively correlated with support from a current teacher and a past teacher (r=0.37, p=0.012; r=0.43, p=0.004). Parental support in the past and support from the significant other showed weak positive correlations (r=0.28, p=0.065; r=0.31, p=0.043). Not only support from past and current teachers (r=0.39, p=0.008; r=0.36, p=0.017) but support from friends (r=0.47, p=0.001) also showed significant positive correlations with performance quality.

Conclusions

The present results indicate that not only current teachers, but also past teachers play a key role in helping student musicians alleviate their MPA and boost their self-confidence. As well as support from teachers, support from friends also contributed to the improvement of performance quality on stage. In terms of the developmental process of long-term learning, it is particularly notable that past support, both from parents and teachers, could be important for improving physical and psychological state during performance and performance quality in student musicians.

Keywords

performance anxiety; self-confidence; teachers; friends; parental support

Acknowledgments

Thematic session
Movement and gesture

EXPERTISE-RELATED DIFFERENCES IN CYCLIC MOTION PATTERNS IN DRUMMERS: A KINEMATIC ANALYSIS

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Background

At present little information is available concerning the acquisition of skilled movements in musicians. Although optimally a longitudinal study of changing movement patterns during the process of increasing expertise is required, long-term follow up over several years is difficult to manage. Therefore in the present cross-sectional study a comparative kinematic analysis of skilled movements in drummers with different levels of expertise was carried out.

Aims

The aims of the investigation were (1) to analyze the kinematic differences between beginners, students, and expert drummers; (2) to deduce from the results general rules related to the acquisition of drumming expertise; and (3) to discuss the implications for teaching to play an instrument.

Method

Two highly skilled experts, six drumming students, and four non-drummers participated in the experiment. Fast repetitive drumming movements were assessed using an active infrared measurement setup (SELSPOT-System). Recording was obtained from LEDs positioned over the shoulder-, elbow-, wrist-, and MCP-joint and from the stick at a sampling rate of 300Hz. Kinematic analysis included calculation of angles, velocities, and accelerations and assessment of the relation between velocity and acceleration as phase diagrams.

Results

Temporal accuracy of the drumming movements was related to expertise. In contrast to non-drummers, experts and students revealed a high degree of self-similarity of movements and a predominant use of low-mass distal joints.

Conclusions

Intense training in students and experts results in economic utilization of forces. Percussion teachers can take advantage of the kinematic analysis and improve their instructions according to the student's observed motor pattern.

Keywords

drumming movements; cyclic motor patterns; musical expertise; motion capture; motor learning

Acknowledgments

GESTURAL ANALYSIS OF CHARACTER PORTRAYAL DURING ACTING

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Background

We present the results of the first experimental study of the gestures involved in character portrayal during acting. During dramatic role-playing, actors undergo a process of pretending to be someone who they are not. There are various methods by which actors are able to transition into a role, and these are typically dichotomized as being either mentalistic (i.e. internalizing the inner thoughts and feelings of the character) or gestural (i.e. emphasizing the overt physical and expressive behaviors of the character). Advances in performance technology now make it possible

to study the gestural features of acting in a controlled laboratory setting and analyze how actors come to embody the characters that they portray.

Aims

The current study focuses on the gestural correlates of acting, specifically exploring the manners of prosodic vocalizing and facial expression that comprise a compelling portrayal of a character. The major manipulation in the study is the personality of the portrayed characters, being organized in a two-dimensional manner according to the orthogonal personality traits of assertiveness and cooperativeness.

Method

Twenty-four actors (17 professional actors, 10 female, mean age=42.5, SD=14) performed a semantically-neutral text (roughly 30 seconds in duration) on the stage of a black-box performance laboratory equipped with 16 motion-capture cameras. The participants were equipped with a wireless dual-channel microphone attached to a headset, and were outfitted with 20 passive infrared motion-capture markers placed on landmarks across the entire face. In a random order, actors performed the neutral text while portraying eight different character-archetypes that varied along the two personality dimensions of assertiveness and cooperativeness (i.e. bully, king/queen, hero/heroine, cynic, librarian, recluse, loner, lover) and as themselves as the control condition. The dependent variables were vocal prosody–as characterized by vocal pitch, loudness, rhythmic features, and timbral features–and facial expression, as characterized by the expansion and contraction of the facial motion-capture markers relative to a neutral facial expression.

Results

There was a highly significant effect of assertiveness and a weakly significant effect of cooperativeness on vocal prosody during acting. Assertive characters were significantly higher in pitch and louder in amplitude than unassertive characters. Cooperativeness mainly had an effect on the rhythmic parameters of speech, where cooperatively neutral characters spoke at a faster pace compared to low- and high-cooperative characters. Interestingly, all characters, even the unassertive ones, were significantly higher, louder, and slower than the baseline "self" condition, suggestive of the idea that actors assume a "performance persona" while portraying a character on stage, regardless of the personality features of the character. The analysis of facial expression is currently in progress.

Conclusions

The personality traits of the portrayed characters had a significant impact on the vocal prosody that the actors used in conveying the characters, with regards to pitch, loudness, and rhythm. Actors used these prosodic variables in a contrastive manner in order to differentiate characters from one another based on their specific personality features. These results comprise the first experimental analyses of dramatic acting using professional actors in a performance laboratory.

Keywords

acting; character; embodiment; prosody; motion-capture

Acknowledgments

THE EFFECT OF MUSICAL TYPES ON RHYTHMIC MOVEMENT CHARACTERISTICS IN CHILDREN

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Background

Music has the capacity to induce movement in humans. Such responses during music listening are usually spontaneous and range from tapping to full-body movements such as dancing. The three elements of music, which are rhythm, melody, and harmony, would affect to facilitate movement characteristics. However, it is still unclear how humans embody musical structures to facilitate entrainment, especially for children. Dancers have been found to

exhibit distinct patterns of behavior with different type of musical patterns. Considering dance classes, it is indicated that musical characteristics such as rhythm and melody would affect movement dynamics induced by music. However, few studies have examined the effect of musical type on movement characteristics, especially in children.

Aims

The purpose of this study was to examine the effect of different musical characteristics on movement dynamics in children using tri-accelerometers compared to adults.

Method

Ten university dance students and ten children aged four to five participated in this study. Subjects were asked to perform rhythmic whole body movement with knee flexion-extension and shoulder abduction-adduction and rhythmic foot stepping movement. Tri-axial accelerometers were placed to the trunk, the wrist, and the ankle. Each subject performed two types of rhythmic movements with four different music types. Musical rhythm was set at either 56bpm or 112bpm which corresponded to adagio and allegro, respectively. For each tempo, the metronome tone and the music with a melody were played with movements. Music with a melody was selected from the musical pieces for technical practice not to induce any types of images from a melody influenced by body movement. The order of four different types of music was randomized during testing.

Results

Children tended to show higher peak acceleration of the wrist with the metronome tone compared with music with a melody, especially during foot stepping. They also seemed to move their hands faster with the metronome tone. For adults, they showed significant higher peak acceleration of the trunk compared to children, while greater peak acceleration of the wrist and that of the ankle were obtained for children.

Conclusions

From the results of this study, it is indicated that the effect of musical type to movement characteristics would be different between children and adults. Selecting music during dancing would be important to enhance dynamics of movement in children and adults.

Keywords

music; rhythm; melody; movement characteristics; acceleration

Thematic session
Performance demands II

AN EXPLORATION OF TRANSFORMATIONAL BREATH® FOR ANXIETY MANAGEMENT IN PROFESSIONAL VOICE USERS

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Background

Social anxiety disorders are common with a lifetime prevalence of 12.1% in the general population. Music performance anxiety is categorized as a social anxiety disorder and affects 59% of musicians, often co-existing with depression, generalized anxiety disorder, and panic disorder. Pharmacological management of anxiety can affect important aspects of performance and is not favored within the performing arts community where anxiety is generally considered to be "part of the job." Although well-managed anxiety can enhance performance, severe anxiety and panic attacks can be potentially career threatening.

Skilled vocal performance requires control of the respiratory system. In the pre-performance setting a correlation has been shown between music performance anxiety and hyperventilation. Whether it is fear of negative evaluation or

hyperventilation itself that triggers the anxiety cascade, the discipline required to overcome anxiety during a vocal performance can create tension and affect vocal quality. Negative self-evaluation of the altered voice can further exacerbate anxiety problems.

Transformational Breath® is a breathing technique that can be used in a regular practice to explore and manage anxiety symptoms. It incorporates conscious-connected breathing, mindfulness, body mapping, sound, and movement. It teaches an awareness and relaxation of the breathing that could be used in the pre-performance setting to identify and directly manage anxiety symptoms.

Aims

This empirical research explores the efficacy of Transformational Breath® for the management of anxiety in professional voice users. The existing literature for breathing interventions in anxiety management is discussed and a methodology for the application of this conscious-connected breathing technique in a research setting is established.

Method

Professional voice users with social anxiety disorder were randomly allocated to intervention (n=12) or waiting-list control (n=12) groups. Both groups attended on three occasions to complete psychological outcome measures. Generalized anxiety disorder (GAD-7), depression (PHQ-9), social anxiety disorder (SPIN), music performance anxiety (K-MPAI), and wellbeing (WEMWBS) were recorded. Physiological measurement of blood pressure, heart rate, respiratory rate, oxygen saturations, and peak expiratory flow rate was also undertaken. Participants in the intervention group practiced Transformational Breath® at each attendance and repeated the outcome measures following each intervention.

Results

A single Transformational Breath® session caused significant (p<0.001) reductions in GAD-7, PHQ-9, SPIN, K-MPAI, and heart rate and a significant increase in WEMWBS. A course of three Transformational Breath® sessions caused a significant (p<0.001) reduction in systolic blood pressure and heart rate when compared with controls.

Conclusions

This study provides preliminary evidence for the clinical efficacy of Transformational Breath® to improve generalized anxiety, social anxiety, music performance anxiety, depression, and wellbeing and to reduce physiological measures of anxiety in professional voice users. The breathing technique can be taught in three individual sessions with a facilitator and is intended for independent use in the long-term. This represents a non-pharmacological self-management approach to anxiety conditioning, which could benefit musicians long-term in performance, physical, and mental health.

Keywords

anxiety; breathing; performance; depression; wellbeing

STRESS AND ANXIETY INTERVENTIONS IN CLASSICAL MUSICIANS

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Background

Music performance anxiety is reported by the majority of classical musicians, with rates only continuing to increase. Musicians report experiencing clinically significant physical and cognitive symptoms of chronic stress, anxiety, and depression, throughout all time points researched. While there are a variety of interventions based on current research in both anxiety and chronic stress, these interventions have yet to be widely disseminated.

Aims

The aim of this study is to meta-analyze performance anxiety interventions for musicians in order to find the overall effects of different types of interventions, and the relationship between different aspects of the interventions on the effect sizes. This information can then be used to help better address the problem of stress and anxiety in musicians.

Method

We searched computerized databases including National Library of Medicine's PubMed, Dissertations and Theses (ProQuest), PsychINFO, and Oxford Journals Database. Three trained independent coders extracted demographic characteristics, type of study (whether cognitive, physiological, or both), and information to calculate effect sizes. Comprehensive Meta-Analysis 2.0 (Biostat, Englewood, New Jersey) was used to calculate and compare the overall effect sizes for the studies, using Hedges and Olkin's random-effects model. Effect sizes were compared for all studies, and then for studies by intervention category.

Results

There was a moderate and significant reduction in intervention groups vs. control groups (Hedges' g=-0.63, 95% CI [-0.93, -0.38], p<0.001). The largest effect sizes were found in combination interventions (Hedges g=-0.81, 95% CI [-1.17, -0.46], p<0.001), then physiological with a moderate effect size, with (Hedges g=-0.64, [-1.11, -0.16], p=0.008) and purely cognitive interventions having the smallest effect size (Hedges g=-0.46, 95% CI [-0.76, -0.15], p=0.003).

Larger effect sizes were seen in the longest four studies (ranging 8-14 weeks) with an overall effect of Hedges' g=-0.78 than the five shortest studies (ranging 2-3 weeks) with an effect size of Hedges' g=-0.53. A meta regression was then conducted to see the relationship between the length of the intervention (dose) and the effect of the intervention confirmed that the dose provides a small increase in efficacy for every additional week of intervention received.

Conclusions

Musicians who received treatment for performance anxiety experience a moderate reduction in symptoms compared to control groups (Hedges' g=-0.63, 95% CI [-0.93, -0.38], p<0.001). Combination interventions were most effective, followed by physiological interventions, and purely cognitive interventions. While these interventions reduced performance anxiety, the overall effect sizes are lower than what is found in traditional anxiety interventions. Due to musicians reporting generalized anxiety as well as performance anxiety, future interventions will likely increase their effectiveness by addressing both performance and generalized anxiety. The optimal next step in this field is a combination intervention using both cognitive and physiological components that addresses both performance specific and generalized anxiety characteristics.

Keywords

performance anxiety; anxiety interventions; meta-analysis; anxiety in musicians

PERFORMING CONTEMPORARY CLASSICAL MUSIC AND POPULAR MUSIC LIVE VERSUS PERFORMING IN THE RECORDING STUDIO

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Background

While literature, including autobiographies of popular and classical performers, notes that the live performing and recording studio performing environments are very different, these differences have not previously been brought together in one study, nor have the popular music and classical performing environments been compared.

Aims

The study reported here aimed to compare the experiences of contemporary classical and popular musicians when performing live and when performing in the recording studio. In doing so, the study investigated similarities and differences between performance and process in, and the musical product of, the two performing environments. It also probed similarities and differences between these experiences in contemporary classical and popular music.

Method

The four researchers are performers: one in contemporary popular music and the other three in contemporary classical music. Drawing on a practice-led approach, each researcher documented similarities and differences experienced recently while performing live and performing in the recording studio. In a carefully designed exchange of documentation sheets, each researcher-performer's responses were then viewed by the others, who noted whether they

identified, or not, with the others' responses. The resulting tri-response qualitative data set was then subject to a content analysis, first categorizing similarities and differences and then grouping data further into sub-sets.

Results

Very few similarities between the two performing environments were noted. Differences fell into five categories: technical, presentation, musical, psychological, organizational. Several similarities between the two genres were noted. These included clothing, performance pressure, musical factors such as difficulty improvising in the recording studio, and quality of the recording outcome. Popular music performing, however, noted an emphasis on technology equipment issues when performing live, over-dubbing rather than the group playing as a unit in the studio, and improvising issues. These issues were of interest in contemporary classical music for certain repertoire.

Conclusions

The range of categories within which differences were noted indicates two very different performing environments, which the study has begun to reveal. This knowledge is of interest to professional performers moving from live performance to the studio recording environment in both genres, offering an understanding that they are not the same process for the performer and that the musical outcome is a different product. It is knowledge that might be taught to performance students and, in doing so, might encourage higher education performance institutions to engage students equally with live performance and performance in the recording studio environment.

Keywords

performing live; performing in the recording studio; popular music; contemporary classical music; tri-response qualitative data set

Thematic session
Performance factors I

A HEALTHY INITIATIVE IN A POPULAR SCHOOL OF MUSIC

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Background

The scientific world has for some years explored the health and wellbeing of the pop and rock musician, focusing primarily on psychosocial aspects, issues of noise induced hearing loss, and to an extent the use of substances and the lifestyle of the touring musician. A number of studies of the professional voice user include popular singers. Studies of playing-related musculoskeletal disorders in this group of musicians are very rare. Wehling and colleagues in 1991 in their study of 74 pop, rock, and jazz musicians concluded that 43% never consulted a medical professional for their pain. Rigg and colleagues in 2003 concluded that a substantial number of popular guitarists were experiencing playing-related pain. However, with the knowledge gained from classical musicians and the development and continuing research within performing arts medicine, it is imperative to also extend our attention to popular and rock musicians. The British and Irish Modern Music Institute in London UK (BIMM) recognized the need for a health program within the school since 2011. A performing arts medical specialist, an arts psychologist, and a counselor run clinics. These clinics have enabled the students to consult the specialists on a one-to-one basis and receive advice on further management. In this study we will present results of the various physical conditions affecting these music students, the suggested treatments, and the outcomes. We will also discuss the initiatives taken for prevention and the messages conveyed on the improvement of these health services in established popular music schools.

Aims

We aim to introduce the health initiative of the British and Irish Modern Music Institute and to outline the benefits of the in-house specialist who addresses physical problems of students and staff. We further aim to discuss the feedback and changes of practice processes this program has produced and to project the message that this group of musicians needs the appropriate scientific attention that will address their physical problems and will prevent lifelong injuries that impact on the popular musician's career and wellbeing.

Method

Data from the BIMM Health Clinic's records were collected from the past 6 years and analyzed by music genre, symptom, diagnosis, and treatment. Responses from the clinic feedback are also taken and presented for future learning. 244 students age 18 to 36 attended the Health Clinic, approximately 8% of the average annual cohort in the past 6 years. Of these 29% were drummers, 44% were vocalists, 13% were guitarists, and 14% belonged to the non-performer group (songwriting, music technology, etc.).

Results

Symptom presentation included neck and back pain in 14%, upper limb pain in 27%, foot and ankle pain in 4%, and generalized pains in 17%. 44% of the students presented voice problems. Advised management within the BIMM Health Clinic included postural and technique modifications, review of practice patterns and repertoire, voice hygiene, physical conditioning, exercise prescription, and anti-inflammatory medication. Out of the total of the students attending the BIMM Health Clinic, 11% needed onward referral to other specialists or their general medical practitioners for further investigations and treatment.

Conclusions

A Health Clinic within a music college is of significant benefit to students and staff. It promotes good practice, it encourages discussion between teachers and medical practitioners, it addresses medical issues timely, and it prevents further medical consultations and missed lessons. Musculoskeletal and vocal disorders correlate to the instrument, technique, and lifestyle. A significant number of students lack conditioning and knowledge of their physiology. Opportunities to include these in their curriculum and in regular seminars are paramount. This particular group of musicians with many coming from a less conventional training background, but with great aspirations for their future in a very demanding industry, also present with a combination of psychosocial and physical issues that need multidisciplinary approach. Further research should be developed to study the diverse conditions, their causes, and how best to target health education of the popular musicians.

Keywords

popular musician; health education in music schools; performing arts medicine; PRMDs; pop singers

WHAT HAVE WE LEARNED IN THE REHABILITATION PROCESS IN A CASE STUDY OF A SKILLED PIANIST WITH FOCAL DYSTONIA?

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Background

Task-specific dystonia is characterized by excessive muscle contractions producing abnormal postures during selective motor activities that often involve highly skilled, repetitive movements. Our subject is a 53-year old male professional pianist who has developed dystonic extension of the left 3rd finger while playing the piano in his mid-career (about 8 years).

Aims

The aim of this report is focused on our rehabilitation process that combined a pedagogical application to retrain the dystonic finger motion and using a wireless electrode stimulator on the affected area of the hand. It was immediately evident that the electric stimulation itself was not effecting change in the muscular activity. Deliberate and gradual finger-walk with the minimal required coordinated motion (contraction and co-contraction) at the intrinsic and extrinsic muscles was taught in biweekly, one-hour rehabilitation sessions during the fall semester of 2016. We will show the biweekly change in the playing of a rapid legato scale passage using visual and auditory demonstration. This single-case experiment reveals surprising insights into our modern piano pedagogy, as compared to the traditional pedagogy.

Method

We examined the pianist's hand biometrics and biomechanics, collected precise measurements of temporal and dynamic touch impact on the piano keys using MIDI (Music Instrument Digital Interface), captured Functional MRI while (1) tapping on a flat board on his chest, and simulated playing of five-finger scale with the (2) affected and (3) unaffected hands, and used Intramuscular needle EMG (nEMG) to examine the activation pattern of the left extensor digitorum communis (EDC) and the left extensor indicis proprius (EIP).

Results

Our pianist had large hands (reaching three octaves with two hands active spread) with hypermobile joint structure across the hand and arm. MIDI data showed uneven touch control. The MRI demonstrated that pianist's focal dystonia was associated with increased activity in the contralateral sensorimotor cortex and supplementary motor cortex, and Instramuscular needle EMG showed a distinct oscillatory EMG activity in the affected muscle (EDC) that lasted longer after the muscle had completed the execution of the task.

Conclusions

We have learned, from a close and multimodal examination and painstaking rehabilitation process of this skilled pianist with dystonic finger, that in the hurried modern piano pedagogy, we may have lost touch with the heritage that has taught the gradual development of finger technique, arm and weight technique, coordinated upper body movement, whole body engagement, and the mind-body integration. We caution that, while the finger-walk rehabilitation program was effective and the pianist elated during the sessions, staying in this mode of playing outside the lab sessions is unrealistic. The more compelling conclusion is to realize the larger implication that the gradual development of a psychophysiologically complete range of techniques is imperative to cultivate sound and long-lasting piano technique in training our young pianists.

Keywords

Acknowledgements

Friday
01 September 2017

Keynote paper

THE AUDIO-VISUAL MUSIC PERFORMER: INTERMODAL INTERACTIONS IN EVALUATION PROCESSES

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Background

The visual component of music performance as experienced in a live concert is of central importance for the appreciation of music performance. However, up until now the influence of the visual component on the audience's evaluation of music performance has been investigated unsystematically.

Aims

I will start with some historical examples to demonstrate the visual modality as an integral part of music performance over centuries. Reports on concerts of famous virtuosos of the 19th century such as Franz Liszt are a comprehensive source. These descriptions raise two questions: First, how can the influence of the visual component on music evaluation processes be quantified? Second, which theoretical model could give an explanation for potential evaluation differences?

Main contribution

Musical examples from classical and popular music will demonstrate possible methods for providing an answer to both questions. Against the theoretical background of social interaction theory, I will finally argue that performance evaluation can only be understood as an interaction between expectations of audience's sub-classes and observable behavior of groups of performers. A model of music performance elaboration can be an alternative to models of musical communication.

Keywords

evaluation; intermodal; performance; visual; behavior

Poster session II

ARE YOUNG MUSICIANS FIT TO PERFORM?

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Background

Pursuing a music career is a journey that often starts at early ages, with adolescents dedicating a significant part of their days to specialist music practice. Not only do they fully commit to their school agendas, they also take part in auditions and competitions along with a rigorous practice schedule. While this demanding routine may result in successful achievements, it may also bring physical and psychological challenges that can hinder a music career.

Evidence shows that there is a high incidence of performance related musculoskeletal problems, performance anxiety, and other health issues among musicians. Risk factors include past history of injuries, change of teachers or learning method, constant pressure to excel, and perfectionism. However, little is known of the physical and psychological demands of music making faced by young students and how it may impact their health and wellbeing. There-

fore, it is relevant to investigate in which extent young musicians are developing the physical strength and psychological resilience required to face the challenges of becoming a professional musician. The study presented here forms part of Musical Impact (2013-17), an interdisciplinary project investigating the health and wellbeing of musicians studying and working in the United Kingdom.

Aims

The aims of this poster presentation are twofold: to provide new evidence on young musicians' health and wellbeing profiles, and to discuss implications for specialist music education.

Method

One hundred and twenty young musicians aged 16-18 years old took part in a comprehensive screening protocol addressing lifestyle, psychological and health-related fitness variables. Descriptive and comparative analyses were used to explore sex and instrument group differences, as appropriate. Comparisons with normative data were also conducted as well as correlations between measures of physical and psychological health and wellbeing.

Results

Analysis of data collected is currently underway. Findings will provide new evidence on lifestyle, psychological, and physical profiles of young musicians. In particular, we will address health-promoting behaviors, fatigue, sleep quality, lifestyle habits, perfectionism, coping, wellbeing, perceived health, and health-related fitness. Results will be compared with existing normative data or similar studies of same-age groups, allowing for a more comprehensive picture of young musicians' health and wellbeing. Results will be discussed in relation to the physical, psychological, and social demands faced by young music students.

Conclusions

This study is among the first to provide a comprehensive profile of young music students' health and wellbeing, including their lifestyle, physical, and psychological readiness. It will provide new evidence of the normative behaviors and attitudes of young musicians and how it may facilitate, or hinder, performance success. Two main questions emerged from this study and will be discussed: (1) how well developed are the psychological and physical skills of young music students that may facilitate negotiating the demands of a music career, and (2) how this evidence may inform individuals, institutions, and the sector to take action to ensure healthy and sustainable music careers from young ages.

Keywords

adolescent musician; lifestyle; wellbeing; health; fitness

Acknowledgments

CAN IMPROVISATION OFFER CLASSICALLY-TRAINED MUSICIANS A "PROCESS-OVER-PRODUCT" APPROACH TO LEARNING AND PERFORMANCE?

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Background

Current musical practice is still largely dominated by aesthetical visions of the 18th Century (i.e. the sublime and the beautiful). Reinforced by social changes, in particular the rise of the middle classes during the 19th century, and widespread technological and media influence during the 20th, such visions associate musical creativity with a transcendental act of composition: composers aspire to both emulate and overcome the genius and originality of natural forces in their production of musical products or works. Performance has risen to the challenge of interpreting the content of such products with the ideals of Werktreue: the accurate and transparent rendition of scores. As such, musical practice can be divided into those that compose and those that interpret; both paths of development being dominated by the idea of rigidity—that communication is the successful transmission of fixed formal elements in a score.

Improvisation offers a middle road between the two poles of composition and interpretive performance; it offers the performer a share in the creative process, a new perspective to listeners of classical music being live process rather than a reflection on past products, and a different learning experience to students. However, little is known about the learning processes of improvisation and compared to other art forms, classical music is marked by a rarity of improvisational practice, both in performance and learning.

Aims

The principal aim of this paper is to offer psychological insights into the experience of learning to improvise as a classical musician. While learning, I understood that many of the cognitive and emotional barriers to improvisation occur because of one's training as a classical musician—a training which places the products of others' creativity at the center of practice. Improvisation offers a challenge to classically-trained musicians to adopt a process-orientated approach to music, but it is a perspective which is not automatically learnt through improvising. My further aim therefore is to make explicit the learning techniques necessary to acquire a process-based approach to improvisation.

Main contribution

(1) To outline the development of attitudes towards creativity that result in an ideology that reifies music as a product. On the acceptance of ideology functioning psychologically to govern cultural practice, improvisation can be seen to have no intrinsic rationale within this practice, unless as a lesser and compromised form of creativity.

(2) I review and criticize contemporary models of classical improvisation that promote improvisation as a product, rather than a process.

(3) I clarify the principal differences in learning and performance techniques between a product and a process-orientated approach towards improvisation. These include areas such as attentional focus, clarifying extrinsic and intrinsic goals, monitoring feedback, and managing task constraints.

Implications

The present study represents the first steps towards a pedagogy, based in psychology, which makes explicit a process-based approach towards improvisation. Such a pedagogy, if brought to fruition, could potentially encourage many musicians to engage in improvisation, who, because of implicitly learnt assumptions about musical practice, are emotionally and cognitively barred from any such creative practices.

Keywords

classical; improvisation; learning; music psychology; process vs. product

THE INFLUENCE OF ARTICULATION AND DYNAMICS ON THE PERCEPTUAL ATTACK TIME OF SAXOPHONE TONES

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Background

The perceptual attack time (PAT) is the point of time when the rhythmic information or weight of a tone is perceived. It is located after the physical and perceptual onsets of a tone. It was initially proposed and discussed in the 1980s. In these and in more recent studies, the PAT was determined experimentally with the goal to create a prediction model. A correlation between the onset rise time of a tone and its PAT was proposed. In these studies, large datasets of samples from many different instruments were used and measurements for PAT in those experiments had a large standard deviation. This led to an inaccuracy in the prediction models. While dynamics were considered in one study, articulation was not discussed.

Aims

This paper focuses on the (tenor) saxophone. Its aim is to show that techniques of modifying a tone, namely its dynamics and articulation, have a significant influence on the location of the PAT.

Method

A synchronization approach was used. Participants (20 professional saxophone players, 20 musicians playing other instruments) were presented two audio samples in a loop in each test: one was the saxophone tone to examine and the other a click as reference. Participants displaced the saxophone tone to a location, where they heard the two tones

as played in perfect synchrony. Starting locations of the two tones varied—in 50% of the tasks the saxophone tone was at first before the click, in the other half behind the click. Every participant did the test with all saxophone tones. Those varied in dynamics (soft, medium, loud) and articulation (without tongue, soft tongue attack, strong tongue attack). Two additional tones were played with medium dynamics and slap tongue attack. A total of 11 tones were tested (3*3+2).

Results

The tests showed a significant difference in PAT location for the 11 tones ($F_{10,429}$=22.82, p<0.001). Main effects were articulation ($F_{3,436}$=44.36, p<0.001), dynamics and their interaction. PAT estimates had smaller standard deviation when the tones were played louder and with a stronger tongue attack. The results of the saxophone player group were not significantly different from the other group. The starting location of the two tones in the experiment was significant. If the saxophone tones started ahead of the click, the PAT was located earlier in the tone. The results were therefore also looked at with starting locations separated.

Conclusions

The PAT is not the same for all 11 tones. Articulation and dynamics should be concerned when creating models to predict the PAT. Especially articulation has an important role in determining where the PAT is perceived. The theory, that the PAT is correlated with the onset rise time could not be supported. Expertise had no significant influence on the standard deviation of PAT estimates. The influence of the starting location of the tones can be explained with a masking of crucial moments of the saxophone tone and leads to conclusions about the methodology of similar future projects.

Keywords

perceptual attack time; musical instruments; synchrony; onset rise time; playing technique

CONSIDERATIONS REGARDING COLLABORATION BETWEEN COMPOSER AND PERFORMERS IN "DE QUE SÃO FEITOS OS DIAS?" BY SILVIA BERG

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Background

De que são feitos os dias? was composed in 2008 by Silvia Berg for the In Tempori Duo, formed by the trumpeter Carlos Sulpicio and the percussionist Eliana Guglielmetti Sulpicio, the first Brazilian duo of this genre. This is the first Brazilian piece for trumpet and multiple percussion, and its execution is preceded by a poem by Cecilia Meireles, a Brazilian poet.

Aims

In this paper, we discuss the importance of interaction between composer and performers and we describe how it was done during the compositional and performance process of *De que são feitos os dias?*

This kind of collaboration can be observed throughout the history and many composers had written for a specific performer. Famous examples include collaborations between J. S. Bach and Gottfried Reiche, Giovanni Gabrielli and Girolamo dalla Casa, Johannes Brahms and Joseph Joachim, L Berio and Cathy Berberian, and Luigi Nono and Maurizio Pollini among others. Borém mentions that, during the second half of the 20th century, the more important concerts for double bass were written as result of composer and performer collaboration. According to Foster, "Trumpet and percussion instruments have histories and centuries-old relationship [sic] with one another." Several ancient societies used these instruments in battles as a form of communication. In the Renaissance, they were partners in different kinds of ensembles, and during the 20th century, they integrated together various chamber ensembles. However, its combination in duos and trios is relatively new.

According to Dunn, music for trumpet and percussion can be considered a new genre of chamber music: "During the last four decades of the 20th century, over [one] hundred works were composed for trumpet and percussion in chamber music settings for two or three players. This body of literatures represents the beginning of a new genre of chamber music that is gaining momentum at turn of the 21st century." Trumpet and percussion chamber music began to appear by 1963. Trumpet-playing composer William A. Billingsley, in order to expand his trumpet recital repertoire, composed and performed *Brief Encounters*. Writing for this kind of instruments can be very challenge and collaboration between composer and performer can be crucial. According to Ray, the 21st century presents a different

performer, who is also a partner in the creation music, and he or she is also interested to expand the repertoire for his or her instrument.

Method

The method used is based on bibliographical research to support a background about the subject and empirical experience between composer and performers.

Results

In this specific case, the results from this collaboration show the alterations made in the score, which demonstrates in its final version a very original and consistent idiomatic approach for the instruments.

Conclusions

Beyond the collaborative practice between composer and performers during the process for finalizing the specific piece, it was fundamental this kind of interaction.

Keywords

multiple percussion; trumpet; collaboration between composers and performers

NEURAL CORRELATES OF BOW TECHNIQUE LEARNING IN VIOLIN BEGINNER STUDENTS

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Background

Motivated by an improved design of assistive learning technologies, previous research has investigated the presence of biomarkers during human sensorimotor learning using EEG. For instance, it has been observed that linear and bilateral EEG alpha, as well as high theta increases in power, correlated with enhanced kinematics in participants during the performance of a visuomotor task which required learning and adaptation, while the control group did not show variations in kinematic and electrophysiological parameters.

Aims

The aim of this work is to find EEG biomarkers associated to different cognitive states during the process of learning a musical instrument, taking the violin as a case study. We will also study the impact of an interactive, assistive and feedback music learning system during the process of learning bowing techniques in violin beginner students.

Method

Participants were total beginners in violin playing. Participants were shown a 10 minutes instructional video on stance and violin position and were asked to play 21 trials consisting of four up and down bowing movements (playing the A open string). Participants were asked to achieve a stable tone and dynamics. EEG data and violin audio was recorded from each participant in order to find a correlation between an improvement of the generated sound and topographic changes in cortical activity. Sound quality was evaluated based on pitch stability and dynamic stability computed from the violin audio across trials in order to assess improvements in the performance.

Results

Preliminary results showed a linear decrease on the average power of the alpha and high theta bands in the left temporal lobe across trials. Participants also showed an improvement in both pitch stability and dynamic stability measures recorded from the audio. The average correlation value of the improvement of the sound and the alpha band power located in the left temporal lobe across trials was 0.75 (p=0.52). A maximum correlation of 0.83 (p=0.02) among participants was found between alpha band power and pitch stability improvement across trials.

Conclusions

Preliminary results seem to indicate that there is a correlation between features extracted from the EEG signal of a beginner violin student and his/her learning progress. These biomarkers would allow us to assess the motor performance level of students and could be a first step towards the design of interactive real-time feedback e-learning systems.

WHAT IS THE EFFECT OF ACTIVE MUSIC PARTICIPATION ON WELLBEING AMONG ADULTS WITH LEARNING DISABILITIES?

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Background

All known cultures experience music in some form and the healing aspects of music have been acknowledged for over 30,000 years. Wellbeing has become the new buzzword in many research domains. Despite much anecdotal evidence supporting the benefits of music on wellbeing for people with learning disabilities, empirical evidence has been sparse. This has particularly been the case concerning active music participation and wellbeing as a whole single construct. Existing research has tended to focus on separate components of wellbeing, which has presented an incomplete picture. Research has indicated that music participation within various target groups has the potential to produce a far-reaching range of benefits to wellbeing, such as mood improvement, stress reduction, social engagement, development of self, and personal fulfilment. For example, older adults, people with autism, and mental health sufferers have all shown positive outcomes after participating in musical activities. Adults with learning disabilities have typically been under-represented in terms of wellbeing research and there is very little literature examining music participation within this community, particularly within the UK. A systematic review of past and current literature further supported the absence of research in the field. Rather worryingly, adults with learning disabilities often experience a regression in both cognitive functioning and life skills as a result of a reduction in support levels and social opportunities once outside of the supportive educational environment. The resulting decline in wellbeing levels is an area of concern that requires further research into likely management strategies.

Aims

This paper aims to explore the potential benefits of active music participation (for example singing, African drumming, percussion, ukulele, and drum kit) on wellbeing for people with learning disabilities, with a focus on adults with Down's syndrome.

Main contribution

This research is exploring an identified gap using: (1) Study 1 - an ethnographically-informed case study of the Music Man Project; (2) Study 2 - an exploration into the prevalence of music usage within the UK Mencap network; and (3) Study 3 - an investigation into the impact of a 10-week music intervention program on wellbeing, delivered and supported by the Music Man Project. It aims to highlight the wellbeing benefits of active music participation for adults with Down's syndrome.

Implications

This research has the potential to provide evidence for music making as an accessible and economic wellbeing support strategy for people with learning disabilities, creating an opportunity to enhance wellbeing for this marginalized group in society. It is essential to provide equal access opportunities to music making and its associated wellbeing benefits to people with learning disabilities, comparable to the non-learning disabled community.

Keywords

active music participation; wellbeing; learning disability; Down's syndrome; Music Man Project

A COMPARATIVE EVALUATION OF GROUP AND PRIVATE PIANO INSTRUCTION ON THE MUSICAL ACHIEVEMENTS OF BEGINNERS

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Background

The beginning years of piano instruction are influential to fundamental performance skills that the student will continue to build upon. Although for decades prominent scholars have affirmed benefits of teaching beginners in a group setting, far fewer piano teachers offer group lessons than private lessons. A comparative study to investigate how these two modes of piano instruction influence learning outcomes should help teachers formulate even more effective methods for their students to develop better fundamental performance skills and musicianship.

Aims

In this study, I compared group instruction and private instruction based on musical achievement of beginning piano students, aged 5-7. I also investigated the relationship between achievement and children's age and gender.

Method

Forty-five children ages 5-7 without previous music training completed 24 weeks of either group (n=22) or private (n=23) piano instruction. Participants included 25 boys and 20 girls, and comprised twenty-seven 5-year-olds, nine 6-year-olds, and nine 7-year-olds. After completing 24 weekly lessons, participants underwent a post-test evaluating (1) music knowledge, (2) music reading, (3) aural discrimination, (4) kinesthetic response, and (5) performance skill.

Results

I used MANOVA procedures to analyze responses across the five achievements measured between instructional (group, private), gender (boys, girls), and age (5 yrs, 6/7 yrs) groups. Results generally supported the main hypothesis that there was no relationship between different instructional modes and music achievement. However, a significant interaction was found between instruction mode and age, most notably within the area of kinesthetic response. In this category, children aged 5 who participated in group instruction outperformed peers receiving private instruction. By contrast, children ages 6-7 receiving individual instruction outperformed their peers undergoing group instruction. Similar trends were evident in the other music achievement categories.

Conclusions

The significant interaction between instruction mode and age might relate to children's concentration and motivation in class because kinesthetic responses training was mainly conducted in class instead of home practice. During the treatment period, I found that children at age 5 tended to be more focused and motivated in participate kinesthetic exercises than children at ages 6 and 7 in the group lessons. Older students were more reluctant to participate and were easily distracted by their peers in group instruction. Although private instruction is 20 minutes shorter than group instruction, 5 year-old children tended to lose focus more easily in the private instruction but children aged 6 and 7 possibly made much better progress due to less distraction from peers. These conclusions may suggest: (1) younger children tend to have more optimal motivation for group participation than older children; (2) older children are more likely to feel embarrassed and reluctant to participate in group instruction due to increased sensitivity in social comparison; and (3) with more developed social skills, older children may experience more distraction within the group that could hinder learning.

Keywords

group instruction; children's learning; piano; music achievement; teaching format

MUSCULUS PALMARIS LONGUS: INFLUENCE ON PLAYING CAPABILITY OF KEYBOARD MUSICIANS—PRELIMINARY REPORT

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Background

Musculus palmaris longus is usually described as a slender, spindle-shaped muscle starting at medial epicondyle of the humerus and inserting itself into palmar aponeurosis. It is one of the most variable muscles of the human body with most common variability being absence. It is classified as a weak flexor of the wrist, however, his action affects also flexion in metacarpophalangeal joints and opposition of the first and the fifth finger. There is some research proving that certain variations of the muscle can affect occurrence of multiple hand and wrist dysfunctions, carpal tunnel syndrome included, yet according to textbook knowledge, the palmaris longus muscle has no impact on function of the upper extremities and its absence or presence is completely irrelevant for manual capability. Supposedly, the only medical importance of the muscle is its common use in tendon grafts resulting in its removal.

Aims

The aim of this study is to examine and describe influence of palmaris longus muscle's variability, especially its absence, on playing capability of keyboard musicians.

Method

Materials consisted of 42 hands and forearms of 21 healthy individuals. A group of 11 keyboard musicians (age from 19 to 38) had their palmaris longus muscle's morphology examined by USG and Schaeffer's test. Their hand grip strength and selectively first and fifth finger opposition strength have been measured by dynamometer before and after a 15 minutes piano playing test designed for the sake of this study. The results have been compared to the results of non-musician control group (10 people, age from 20 to 25) with piano playing test being substituted with 15 minutes hand grip stamina test.

Results

In both groups a specimen with unilateral and bilateral absence of musculus palmaris longus has been discovered.

In the control group the mean difference between dominant and non-dominant hand strength after exertion changed by 0.4 kg (grip) and 0.7 kg (opposition) for bilateral presence, 0.1 kg (grip) and 1 kg (opposition) for unilateral absence (left), and 1.2 kg (grip) and 0.7 kg (opposition) for bilateral absence.

In musicians the mean difference between dominant and non-dominant hand strength after exertion changed by 0.5 kg (grip) and 0.1 kg (opposition) for bilateral presence, 4.2 kg (grip), 1.2 kg (opposition) for unilateral absence (left), and 2.6 kg (grip) and 0.7 kg (opposition) for bilateral absence.

Conclusions

Proportionate post-exertion change in opposition strength in musicians with bilateral presence of musculus palmaris longus and noticeable disproportionate change in a musician with unilateral absence alongside lack of such in control group give reasons to believe that absence or presence of musculus palmaris longus has effect on playing capability of keyboard musicians.

Keywords

palmaris longus; musician; morphology; hand; wrist

Acknowledgments

AN EXPLORATION OF MEMORIZATION STRATEGIES IN NON-TONAL PIANO REPERTOIRE

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Background

The topic of musical memorization has been a dominant interest among music psychologists as it gives insight into the cognitive processes involved in the encoding and retrieval of musical information. Previous research has suggested that professional musicians develop retrieval schemes, similar to experts in other fields. Their previous knowledge of tonal structures offers a ready-made framework, which can be used to hierarchically organize the information. Subsequently, sectional boundaries or other features of the piece can be established as landmarks, often identified as Performance Cues (PCs), in order to help musicians keep track of where they are during memorized performance. Nevertheless, existing research mainly focuses on tonal music, with structures and patterns familiar to most musicians. Therefore, a direct relation of their findings with non-tonal repertoire may become challenging.

Aims

The main aim of this study is to explore concert pianists' attitudes and experiences of learning and memorizing non-tonal music, namely contemporary piano repertoire that moves away from tonality.

Method

The study was based on semi-structured interviews with six professional pianists with a large experience of learning and performing different styles of contemporary piano repertoire. Half of the participants typically perform contemporary repertoire from memory, while the other half usually performs with the score. Data from the interviews were fully transcribed and analyzed through Interpretative Phenomenological Analysis.

Results

Three main domains have emerged in the analysis of the interviews: (1) attitudes towards performing from memory; (2) difficulties and barriers felt when learning and memorizing contemporary music; and (3) experiences of learning, memorizing, and performing contemporary music from memory. The results have revealed two distinct attitudes towards the performance of this repertoire, being the participants divided between performing by heart and using the score. Nevertheless, common difficulties and barriers felt when learning and memorizing this repertoire were reported, namely problematic notation, lack of structure and obvious patterns, and the limited number of performances of this repertoire. The pianists also described the use of learning and memorization strategies not often reported in previous studies on musical memorization, namely a hierarchical organization of the piece based on their knowledge of specific features of contemporary composer's language or a reliance on the combination of gestures used throughout the performance, namely the movement of the hands or the movement of the body.

Conclusions

This research provides insights into how musicians may develop retrieval schemes in the context of music that is tonally and structurally less familiar. The main aim is to extend existing knowledge on musical memorization to other types of repertoire and to provide practical applications for pianists who dedicate themselves to the performance of non-tonal music. These results have been further investigated in an observational self-case study, where the first author closely examined her entire process of learning and memorizing a commissioned piece for prepared piano.

Keywords

expert memory; memorization strategies; music practice; problem-solving; non-tonal music

THE EFFECT OF MUSICAL TRAINING ON 3-YEAR-OLDS' RHYTHMIC ABILITY AND AUDITORY PERCEPTION

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Background

Previous research suggests that music perception skills are closely related to skills necessary for language reading acquisition. Good auditory perception skills are vital for success in language reading and recent research suggests that musical training enhances aural perception, not only for musical sounds but also for speech sounds.

Method

The purpose of the present study was to test whether a 12-week musical intervention program could enhance auditory skills of 3-year-olds in Icelandic preschools. A pretest-posttest design was employed with a treatment group and control group. A total of 79 3-year-olds in four preschool facilities were recruited for the study. The pretest and posttest examined the children's auditory skills in terms of phonetic awareness, detection of isolated linguistic sounds, musical rhythm (active skill and passive judgments), and singing ability.

Results

Results indicated statistically significant differences between control and treatment groups after 12 weeks of musical intervention. The experimental group had slightly lower scores than the control group before treatment, although that difference was not statistically significant. After treatment the experimental group scored higher than the control group and made significantly larger gains over the control group on phonetic awareness and on two measures of rhythmic ability. No measurable effect was found in singing ability between the two groups. Further studies are needed to better understand the role of musical activities in early childhood facilities on cognitive skills.

Keywords

rhythmic ability; auditory perception; intervention; preschool; cognitive skills

BENJAMIN BRITTEN: A STUDY IN VOCAL ACOUSTICS

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Background

Some composers seem to know instinctively how to compose for the voice. Benjamin Britten is a perfect example of a composer who seemed to know exactly how to compose for the voice, particularly the tenor voice, no doubt due to his close relationship with tenor Peter Pears. But is his relationship the only explanation, or is there some other aspect, one that can be mirrored and perhaps taught to other composers, one that would explain why Britten's vocal writing is so vocally and expressively easy to sing?

Aims

The aim of this paper is to explore this question through a vocal acoustics and relevant musical analysis of Benjamin Britten's *Serenade for Tenor, Horn and Strings*, and *A Charm of Lullabies for Mezzo Soprano and Piano*. The analysis method is derived in part from Kenneth Bozeman's book, *Practical Vocal Acoustics: Pedagogic Application for Teachers and Singers*.

Method

Kenneth Bozeman in his book, *Practical Vocal Acoustics*, primarily discusses the interaction of the first and second harmonics with the first formant producing different timbres. He identifies them as "Open Timbre," "Yell Timbre," "Closed Timbre," and "Whoop Timbre." Open Timbre is defined as, "when two or more harmonics lie at or below the first formant." It is described as "bright" and is generally appropriate for loud dynamics or low pitches. Related to Open Timbre is an extreme timbre called "Yell" where the $2F_0$ is coupled to the F1 and maintained as pitch ascends or descends, and is generally not appropriate for classical singing. Closed Timbre is defined as, "when the second harmonic crosses above the first formant," it is described as "domed," and is considered to be appropriate for higher pitches and louder dynamics. An extreme of version of Closed Timbre is when the $1F_0$ is coupled to F_1 and main-

tained as pitch ascends or descends. Whoop is described as a "hootier," full timbre and is appropriate in male voices for soft dynamics and in the upper female range for both loud and soft dynamics. Using Bozeman's timbres and formant/harmonic relationships, and using McCoy's suggested pitches for the vowel formants, we identify and label the likely timbre created by the formant harmonic relationship and compare that to Britten's dynamic and expressive markings for agreement and disagreement.

Results

Our analysis will show that Britten chose to place specific vowels on specific pitches so as to aid in the vocal production and the musical expressiveness by taking advantage of principles of vocal acoustics.

Conclusions

We conclude that Britten's knowledge of vocal writing was at the very least intuitively concerned with vocal acoustics, if not deliberately. Furthermore, we recommend that this type of analysis become a standard addition to the analysis of vocal music, and that the formant/harmonic relationships be taught to composers so as to improve the quality of vocal compositions.

Keywords

formants; harmonics; music theory; analysis; singing

CONSTRUCTING A MUSIC PERFORMANCE DATABASE WITH PHRASE INFORMATION

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Background

Performance databases that can be referred to as numerical values play important roles in the research of music interpretation, the analysis of expressive performances, automatic transcription, and performance rendering technology. The authors have promoted the creation and public release of the CrestMuse PEDB (Performance Expression DataBase), which is a performance expression database of more than two hundred virtuoso piano performances of classical music from the Baroque period through to the early twentieth century, including music by Bach, Mozart, Beethoven, and Chopin. The first edition of the CrestMuse PEDB (ver.1.0-3.1) has been used by more than fifty research institutions throughout the world. In particular, it has contributed to research on the performance rendering systems as training data.

Aims

The size of the PEDB first edition is not necessarily large, compared with the other databases for computer science. Demand for increasing the database has been increasing in recent years, particularly in the studies using machine learning techniques. In addition, data that explicitly describe the relationship between a performance and the musical structure that the performer intended is required. Although virtuoso performances remain in the form of an acoustic signal, we had no choice but to estimate the performer's intention from the recorded performances, in many cases. Responding to these demands, we started a new three-year project in 2016, to enhance the CrestMuse PEDB with a second edition.

Method

One of the major problems with making the first edition was the workload required for the manual transcription processing of performances in the form of an acoustic signal. To solve this problem, we employed an approach to collect the newly recorded performance data using Yamaha Disklavier, with the cooperation of skillful pianists who have won prizes in piano contests. This procedure enabled us to obtain music performance control data (MIDI) and acoustic data simultaneously. After the recording, we interviewed the pianists on how (s)he to tried to play to express the intended structure. To improve the efficiency of further analysis and utilization of the database, each of the notes in the performance data should be given information of the corresponding note in its musical score. For this goal, the matching file is generated using our original score-performance aliment tool.

Results

We released a beta version of the second edition PEDB consisting of 100 performances of 41 pieces by two professional pianists to investigate the users' requests for the database. Music structure data in the beta version include phrase and sub-phrase, and apex notes in each phrase, in a PDF format.

Conclusions

In this abstract, we introduced our latest attempt to enhance the PEDB. At the symposium, we are going to show the aim of the project, the actual data production procedure, and discuss how to utilize the database. We hope that the database can be utilized for research in many research fields related to music performances.

Keywords

musical expression; phrase information; database; performing rendering; musical interpretations

HOW DO THEY KNOW THEIR MUSICAL INTERPRETATION IS ACCURATE? THE ARTISTIC APPROPRIATION OF NINE EXPERT MUSICIANS

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Background

Few studies have focused on the creative process in the work of music interpretation. In a case study, Héroux and Fortier reviewed work stages already in the literature, but also identified a new phase artistic appropriation, in which the musician focuses on expressivity in order to realize, with the musical instrument, the mental artistic image of the music as a personal creative interpretation of the score. This phase allows the musician to give uniqueness to interpretations through the use of different strategies and creative processes, such as divergent and convergent thinking and creative association. But in this work phase, how do musicians evaluate the validity of their playing in order to express the musical material? How do they know that their interpretation of the score and the results are accurate?

Aims

The aim of this paper is to investigate how nine professional musicians evaluated the accuracy of their interpretation choices and their playing while working on music interpretation for a recorded performance. This is a part of a comprehensive study that aims to understand the creative process in the shaping of experts' musical interpretations.

Method

Data was collected by videotaping rehearsals with verbalization, combined with a reflexive questionnaire and the description of the musicians' actions by a third-party observer. The data was first analyzed through a content analysis with NVivo 8. Next, interview techniques borrowed from phenomenology were used, i.e. self-confrontation interviews and explicitation interviews, which enabled the verbalization of the action a posteriori. Grounded theory analysis was used to analyze the data from a phenomenological point of view.

Results

Results show that reflection, feelings, emotions, body reactions, and intuition were used by our participants to evaluate the accuracy of their musical interpretations. Although some were using a more intellectual approach, primarily reflection, the feeling of great satisfaction, beauty, and happiness were reported for all musicians as consequences of the accuracy of the interpretation while playing.

Conclusions

This research contributes to knowledge in performance practice and music pedagogy. It suggests that we must give students solid musical and theoretical tools to make judgements regarding their own musical choices, which is what music training usually does. Also, we should encourage the development of a personal sense of accuracy in interpretation in order to enhance decision-making abilities in shaping a creative interpretation.

Keywords

creativity; interpretation; methodology; phenomenology; performance

AN INVESTIGATION INTO MUSICIANS' AWARENESS OF THE POTENTIAL IMPACT OF THE MENTAL AND PHYSICAL DEMANDS OF MUSIC TRAINING AND PERFORMANCE

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Background

It is now generally acknowledged that the physical and mental demands of high level music making can be as great as those associated with the related disciplines of dance and sport, and in some instances, considerably higher. Traditionally, however, musicians have been found to be either unaware of the potentially devastating and personally challenging effects of mental or physical injury, or reluctant to disclose problems that might impact on their ability to work. This research study is part of a larger Conservatoires UK project entitled Musical Impact.

Aims

The aim of this study is two-fold: first, to investigate to what extent music performers understand the significance to them of playing related injury; and secondly, to what extent they understand the likely root causes, related to the (often extreme) demands they place upon themselves, and also to the environment within which they work.

Main contribution

We expect to be able to raise musicians' awareness of the causes and effects of physical and mental playing-related injury upon themselves and their careers. This should also encourage better understanding of the need for acceptance and seeking help at an early stage, thereby paving the way for possible adaptations to technique or psychosocial performing environments.

Implications

Extending knowledge and application of this aspect of performance research, this study has the potential to bring a positive influence to future development of training methods, treatment of problems, and performers' reflective practice in management of their own performing environments.

Keywords

musicians; performance; demands; experience; understanding

GASPARD DE LA NUIT IN DIGITAL ERA: INTERACTIVE, IMMERSIVE, AND IMPRESSIVE-AI PERFORMANCE

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Background

Gaspard de la nuit is Maurice Ravel's terrifying piano masterpiece filled with imaginative, unearthly music, which you must be extremely skilled to play. The origin comes from the romantic poetry written by Aloysius Bertrand in the fantastic manner of Rembrandt and Jacques Callot. "Gaspard de la nuit in digital era" is a piano recital accompanied with interactive visual art. The world premiere was performed by distinguished pianist Hsing-Chwen Giselle Hsin with digital imageries created by C.M. Hsieh in the National Concert Hall in Taipei, Taiwan on December 18th 2016.

Aims

One of the goals is to find significant interplay between live performance and interactive visual art. Real-time generated image can, at visual artist's sense of propriety, respond to composer's musical structure and pianist's performing techniques in live performances. The second goal is to enhance the immersive sensation that appears to surround the audiences. The projected image is designed to create three-dimensional scenery, and further improve ambience. The third goal is that the impression of "underwater" and "nightmare" should be interpreted in the manner of digital fashion.

Method

According to Ravel's music and Bertrand's poem, we design two symbolic characters to express the ambience: one is Ondine underwater; the other is Scarbo in a nightmare. Then, we integrate two kinds of algorithm: one is procedural generation with particle system; the other is artificial intelligence (A.I.) generation, to express the impression of water and nightmare. In other words, computer generating algorithms are regarded as an impressionistic process rather than a mechanical tool. Ondine is illustrated from the ancient Greek statue, Venus de Milo, and then transformed by procedural Perlin-noise, which is known to generate water-like, cloud-like, and billow-like naturally appearing textures. Scarbo is a mischievous dwarf-demon becoming a giant bizarre clown such as Callot's etchings of Pantaloni or Zanni. The imaginary Scarbo is transformed with the help of Google's DeepDream Generator, to express thousands of uncertain impressions of demons.

Results

Procedural Perlin-noise is full of nuances and by interactively modifying parameters such as frequency, amplitude, lacunarity, persistence, etc. we can increase the degree of octaves of Perlin-noise to gain complexity, referring to the intricacy and the precision of Ravel's music. Ravel actually depicts the rich and subtle blurred effect of water with his exotic and dreamy composition having obsessive attention to the smallest details. Procedural Perlin-noise is well suited to the impression of water thanks to the properties of complexity, pseudo-random, and high level of continuity.

Conclusions

Can machines produce delightful nuances and artistic impression? "Gaspard de la nuit in digital era"'s computing mechanism has a notable evolution of big data and machine learning. Our artwork follows Ravel's masterpiece and applies aesthetic computing as new interpretation towards interactive, immersive, and impressive performance. From procedural generation to A.I. generation, we emphasize the accuracy in the mechanism and then await the unpredictable output from the A.I. machine.

Keywords

artificial intelligence; style transfer; aesthetic computing; procedural texture; immersive performance

Acknowledgments

CONFLICT AND COLLABORATION IN MULTIPHASE ORCHESTRA PRACTICE

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Background

Previous studies have shown that the majority of interpersonal conflicts in ensembles emerge from interpretations for performance. Thus, negotiation between performers is necessary. In particular, orchestras often contain multiphase negotiation processes, for instance, practice of each instrumental part, practice of a section that incorporates several instrumental parts, and practice as a whole body. Do negotiations between performers differ at each practice phase? We explore this unclear question.

Aims

This study investigated negotiations among orchestra members, including multiphase practices. We examined: (1) whether adoption of interpretations for performance differs depending on practice phase; (2) how leaders' roles in each practice phase differ; and (3) what types of leaders' behaviors are associated with performers' satisfaction with practice. This investigation can lead to understanding not only social interactions in ensembles, but also in general group activity that contains multiphase collaboration processes.

Method

We conducted a questionnaire survey targeting members of two university orchestras, with a total of 107 students (M_{age}=20.2; 37 males and 70 females) participating. Questionnaires incorporated items addressing types of interpretations adopted, the leader's role, and satisfaction with practice in each phase: individual practice, each type of instrumental part practice, section practice that incorporates several instrumental parts, and two types of whole practice—with a student conductor, and a conductor who conducts the actual concert. After providing informed consent, participants responded to the questionnaires.

Results

Analysis showed that interpretations for performance adopted by members differed depending on practice phase. As the multiphase process progressed from each instrumental part practice to section practice, to whole practice, the number of responses indicating that members adopted compromise interpretations for performance became higher. Meanwhile, throughout all practice phases, the number of responses indicating that members find new interpretations by negotiating with one another was relatively high. Results also suggested that the leader's role differed between part practice and section practice. Part practice leaders created a good mood, while section practice leaders suggested interpretations for performance. Members' satisfaction in each practice phase was associated with leaders and conductors' behavior. In part practice and section practice, satisfaction was associated with leaders' ability to create a good mood in groups and to help adjust opinions. In practice with the student conductor and the conductor for stage performance, as the conductors communicated more instructions, members' satisfaction rose.

Conclusions

Principal findings are the following: (1) members' interpretations for performance differed depending on practice phase; (2) the leader role differed between part practice and section practice; and (3) the leaders' behavior is important for members' satisfaction during both part practice and section practice.

Keywords

orchestra; multiphase practice; negotiation; leadership; interpretation

THE ROLE OF PITCH FEEDBACK IN PIANO PERFORMANCE

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Background

Sensorimotor synchronization is a critical aspect of playing a musical instrument. Temporal and spatial precision of hand movements are necessary to achieve an accurate and satisfying performance. Accuracy and fluency in musical performance have been investigated using altered feedback paradigms in which the timing or content of auditory feedback to key strokes is manipulated. Such experiments revealed that even small temporal asynchronies between action and feedback disrupt the timing of the performance. Longer delays, for example, when the auditory feedback was given only after the next key was pressed (i.e. a one-back feedback) also produced errors in sequencing.

Aims

In the present study we focused on alteration of pitch feedback. We hypothesized that predictability of feedback content would improve synchronization accuracy in piano performance.

Method

We conducted an experiment in which 29 non-musician subjects learned to play a musical sequence on the piano. The sequence consisted of 15 notes, each to be played for 500ms. Subjects practiced the sequence a few times with normal auditory feedback by means of a template so that there was no need to read the notes. When they felt comfortable enough, subjects were asked to play the sequence in synchrony with a metronome at a rate of 2Hz. Three experimental conditions were compared. The first consisted of the correct auditory feedback. In the second condition a stereotypical auditory feedback (the note a') was given after each key stroke. In the third condition each tone was presented randomly out of the set of tones of the correct sequence, resulting in a new random order for each trial. Subjects performed these sequences in blocks. One block consisted of 4 sequences, played in direct succession. Each block was repeated five times resulting in 20 sequences for each condition, and 80 sequences altogether. Piano performance was recorded via MIDI and stored on a computer. From these recordings several performance parameters were analyzed: the percentage of correctly played sequences, the mean and variance of the period between key strokes, and the mean and variance of the phase with regard to the metronome.

Results

The results showed two significant dependencies. First, random auditory feedback resulted in lower sequencing performance (i.e. a lower percentage of correct sequences) than correct or stereotyped auditory feedback. Absolute phase (absolute temporal distance to nearest metronome), in contrast, was significantly more accurate in the stereotyped one tone condition than in the normal or random feedback conditions.

Conclusions

These results suggest that auditory feedback is important for sensorimotor learning and that predictability of pitch modulates both sequencing and timing.

Keywords

sensorimotor; learning; synchronization; auditory feedback

A HOLISTIC LEARNING MODEL FOR CLASSICAL MUSIC PERFORMANCE

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Background

Musicologists, psychologists, and musicians view the learning of the performative psychology and technical aesthetics of music from the late Classical and early Romantic periods in different ways. On the one hand, current studies regarding historical performance practice do not always reach the actual practices of performers. On the other hand, what educational psychologists know about learning constructively seems far removed from how musicians learn instrumental music. This autoethnographic and interdisciplinary postdoctoral study bridges these different approaches in investigating the performance psychology and technical aesthetics using the complete works for fortepiano and cello by Beethoven and Mendelssohn.

Research in the field of music psychology has demonstrated that constructivist approaches to instrumental learning are ideal for the development of intrinsically motivated and autonomous musicians. However, although there is strong evidence that the constructivist description of learning is ideologically and epistemologically faultless, this does not necessarily lead to effective pedagogical practices; due to the misunderstanding that constructivism is simply minimally guided instruction.

According to several scholars, this happens partly because approaches supporting social constructivism have ignored the structures that constitute human cognition. However, the intricate relationships between our three types of memory and the cognitive processes that support constructive learning are critically important to becoming skillful in the performance area. This necessitates that an expert who no longer has teacher feedback and guidance available must use self-regulating tools that can serve as a learning guide.

In addition, this research embraces the idea that researchers should be part of the research process, especially when they are members of the social world they study, and therefore have insider knowledge. Thus, autoethnography works as a metatool with which people can reflect upon and observe their process of learning. Autoethnography is a method that allows individuals to illustrate the value of personal experience, the importance of self-reflexivity, and

the desire for change within a specific context. All these factors contribute to the development of musical identities, which are strongly related to the development of musicianship.

Aims

To introduce a theoretical model that analyzes the relation between theoretical knowledge and professional practice in the performance of classical music. In addition, this study aims at developing the necessary tools for promoting conceptual change and holistic practices among musicians.

Main contribution

Benefiting from my musician-researcher background, I am carrying out this artistic and scientific work—with Beethoven's and Mendelssohn's cello works as its core—by following a research triangulation including a constructivist system for learning instrumental music, a self-regulating learning approach linked to 17 types of academic emotions, 10 types of academic emotions, and deliberate practice, an empirical musicology approach linked to historically informed performance practice, and an autoethnographic perspective.

Implications

This research will offer learners and teachers tools to support autonomous, holistic musicianship, by considering human cognition in connection to constructivist and self-regulated learning of instrumental classical music, historically informed performance, and autoethnography. Through the combination of these perspectives, I intend to achieve a real conceptual change by means of an epistemic-ontological shift in my own beliefs and practices toward this music, which can then inspire the scientific and educational communities.

Keywords

autoethnography; conceptual change; constructivism; historically informed performance practice; professional development

Acknowledgements

LEARNING EXPRESSIVE PERFORMANCE RULES FROM OPERA SINGING RECORDINGS

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Background

Professional musicians deliver expressive performances by introducing variations in timing, dynamics, and timbre in the music they produce. In the past expressive performance has been studied from different perspectives: from analysis-by-synthesis to machine learning-based approaches. Most of the research into expressive performance has focused on classical piano while other instruments such as the singing voice have received less attention.

Aims

The aim of this work is to learn singer-specific expressive performance models and understand how and when expressive transformations take place. In the singing voice opera performances, the libretto is the central component which determines note timing and articulation. While singers may conceptualize the interpretation process differently, the expressive transformations they apply to the score may be similar. We aim to discover similar as well as individual interpretation patterns from a corpus of commercial opera singing recordings.

Method

We learn expressive (duration and energy) models for Josep Carreras and Placido Domingo by applying supervised machine learning techniques to the data extracted from CD recordings of 6 similar composition style a cappella arias. We compute note-specific information and automatically generate an analysis of the arias as theorized by Narmours Implication/Realization model. We also annotate notes with their corresponding syllable stress and phrasing information (end of prosodic unit, sub-prosodic unit, or phrase). Finally, we apply machine learning techniques to induce expressive patterns from the performances.

Results

Some of the rules in the induced expressive models coincide with models previously reported in the literature but others seem to contradict them. Reasons may stem from differences between voice and instruments or the interaction of the score and libretto. Syllable stress is one of the prime indicators of note duration changes for Carreras (lengthen/shorten for strong/weak); in case of conflict between metric and syllable stress, strong syllable stress is the one dictating note lengthening for Domingo.

Conclusions

A significant part of the induced rules indicate that the libretto has a strong effect on how expressive transformations are applied in both of the considered singers. While the investigated singers share some interpretation patterns they also show distinct interpretation styles. A waveform analysis seems to show parallels between expressive singing and literary prosody.

Keywords

singing voice; opera; expressive performance; machine learning

"*DANÇALIZAÇÃO*": SOMATIC EDUCATION IN DANCE TEACHING

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Background

The traditional of academic dance classes and pedagogies frequently happens using traditional methods of teaching, whose focus is on mechanical repetition of movement patterns, according types or levels previously established. In initial phases of teaching young people, early specialization is common, especially when the focus is on the training of technique. As teachers/researchers with experience in the educational process of dance, we are aware that early specialization with emphasis on physical and technical training may limit the potential for motor and artistic development.

Aims

This study proposes reflections on the principles of somatic education as a possibility to organize the pedagogy of dance, especially when we think about the initiation of this art.

Main contribution

Believing that initiation in dance should favor the dancer performing different "choreographic writings" with an effective, safe, and expressive body, the use of somatic education as one of the means in the teaching of dance seems to bring immediate benefit in the qualitative formation of the interpreter, since these techniques emphasize the sensory component as much as, or even more than, the motor component in the execution of a movement.

Implications

Dançalization (dançalização in Brazilian Portuguese) was a term created by us, imported from music (proposed musicalization of Carl Orff in his Orff's method) whose focus is on the use of a proposal of musical self-discovery, encouraging the students to develop their own music. What we propose with *dançalization* is to make use of somatic education to favor the way in which the students organize themselves internally to carry out an action, valuing the process instead of the final product, as well as corporal awareness through sensory experience.

Keywords

dançalização; dance; somatic education; pedagogy of dance

RELATIONSHIPS BETWEEN PERFORMATIVE SPATIAL PROJECTION AND ACTS OF OBSERVERS

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Background

I examine computer-generated visual landscapes, focusing on bodily perception and utilizing them for wellness. In collaboration with yoga instructors, I research how they could use them for bodily training and rehabilitation of patients. As the first step, I aim to visualize how instructors themselves perceive and react to visual landscapes.

Aims

Yoga instructors try to explain to their patients how they perceive their body and react to both the outside and inside of their body. Usually, they express them with bodily motions, the storytelling of the feeling, and visual images (like chakras) of human body. But they find it difficult to let the patients imagine and control the change of physical conditions and psychological states. This ongoing project aims to let computer-generated visual landscapes be available for this purpose in the future. In the first step, I recorded the reacting motions and feelings of instructors, and how they perceived the projected images. The result should be applied to a new production of computer-generated landscapes specialized for the instruction of training.

Method

(1) Visualizing motion structures hidden in spatial appearances of the projected landscapes by using notations. (2) These pre-prepared motion structures are considered cues for how observers react. Those should be descriptions of spatial orientations, motion speeds, and the spatial changing of colors. (3) The observers move and hold their poses in front of the projected landscapes. Their motions are recorded with the tracking system. (4) Interviews of observers; how they felt and were motivated to react during the session. Observers draw their feelings and the streaming of their inner energies.

In this presentation, I will show comparison and analysis by using notations, video facilitation, and the depiction of tracking systems.

Results

The motions of instructors followed spatial motions of the projected images. Their interviews show that they felt like their bodies were synchronized with projected images. They became more conscious with the streaming of their "chi" energies. They concentrated to search for each detailed changing of their inner body, including their organs and muscles. After the session, they could feel and keep relaxation.

Conclusions

The synchronization between the projected landscapes and their inner motions make them more sensitive and aware of physical conditions and psychological states. As the next step, I will let the instructors describe how they control inner motions. This result should be reflected to a new production of computer-generated landscapes specialized for bodily training and rehabilitation. After this, the reaction of instructors will be recorded with both artistic visual facilitations and medical measurements.

Keywords

performative landscapes; spatial projection; motivation of motion; images and wellness; visual facilitation for perception and performativity

Acknowledgments

MEASUREMENT OF MECHANICAL WAVES PROPAGATING INSIDE A PLAYER'S HAND EVOKED BY PIANO KEYSTROKES OF DIFFERENT EXPRESSIONS

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Background

Pianists switch finger movement depending on the targeting sound expression despite of the limitation of piano action mechanism that the travel of the hammer is not controllable after having struck the string. Hence, the behavior of mechanical waves generated by the contact of the instrument and the player, which propagate into the air and inside the piano key and also inside human body, should be different depending on the expression.

Aims

The aims of this study is to clarify the characteristics of different strategies of expression, tenuto, and free swing-stroke by measuring the vibration and acceleration of the key and the players' hand.

Method

Two piano players were employed. The participants were requested to play the A4 key of a hybrid piano with right middle finger intermittently along with a metronome; six A4 notes in tenuto expression were followed by six A4 notes with free swing-stroke, where the finger fell into the key. The piano was digitally muted in order to avoid the influence of the played piano sound, which was presented to the participants via a headphone. The MIDI velocity was showed on an LCD display in real-time so that the participants could play all the notes at around a certain target velocity, which was 45 of 127.

Three contact vibration microphones were placed on the A4 key, the middle phalanx of the middle finger, and metacarpals. The played piano sound was recorded for synchronization. In addition, a triaxial accelerometer was located on the A4 key to measure its movement. The waveforms were synchronized temporally to the onset of the played piano sound and the pre- and post-onset areas were analyzed independently.

Results

Beside the amplitude of the post-onset vibration at three points of both tasks showed strong correlation with the MIDI velocity, the pre-onset vibration of free swing-stroke task showed no correlation. This means that the degree of the impact between the key and the finger does not directly decide the velocity. The fact can be interpreted as the difficulty of controlling the velocity during free swing-stroke strategy. As concerns the post-onset, the acceleration of the key of tenuto-expression task was larger than that of free swing-stroke task. The key traveling may be well controlled during the tenuto-expression task.

In addition, the post-onset vibration amplitude of tenuto-expression task recorded on the key and the finger were larger than those of free swing-stroke task. On the contrary, the waveform on metacarpals of tenuto-expression task was smaller than that of free swing-stroke task. It means that the wave inside the finger propagates into metacarpals with lower attenuation during the free swing-stroke task. It may be caused by the high solidness of the fingers during the free swing-stroke task or the difference of the form of the fingers.

Conclusions

The vibration and acceleration of the key and the hand during the piano playing were measured. The results implied that the travel of the key was well controlled and the solidness of the fingers were low during the tenuto-expression strategy.

Keywords

mechanical vibration; contact microphone; acceleration; tenuto; free swing-stroke

EFFECTS OF DIFFERENT VIOLINS ON MUSCLE ACTIVITY OF THE RIGHT HAND DURING PERFORMANCE

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Background

For violin techniques, the right hand is used not only to determine the pressure of the bow on the string, but also to maintain flexibility in all dynamics and tone quality. Violins are known to have different tones from each other. Do violinists play the same way even when playing any violin? Perhaps the professional violinists are adjusting the way of playing, especially bowing, according to the characteristics of the tone of each violin. Therefore, this study aims to investigate the difference of activities of the right hand muscles when playing several different violins.

Aims

The aim of this study is to investigate the relationship between playing some violins and the right hand muscle activity.

Method

Two semiprofessional and two professional violin players served as subjects. The professional violinists were actively performing around the world. In this experiment, the violinists played their own violin and some other violin. Radiated sound was sampled using a compact microphone (DPA 4060). Surface EMGs (using Polymate AP1532) were collected from the flexor digitorum superficialis (FDS), extensor digitorum communis (EDC), biceps brachii (BB), triceps brachii (TB), and deltoid (DT) on the right side of the arm and hand. All electrical signals were simultaneously A/D converted and stored on a PC (sample freq=2kHz). The open strings tone task (successive G3 [196Hz], D4 [293Hz], A4 [440Hz], and E5 [660Hz] tone productions) and scale task (2 octaves on one string) were performed. Violinists performed only down bow with each sound separated without vibrato, which were performed at 30 bpm during the both tasks. The sound dynamics were at *mf*. This task was continued until data from 15 successive tone productions were attained. Maximum isometric voluntary contraction (MVC) EMG data for each muscle was used to normalize the root mean square values of EMG signals. The EMG variable was mean values for each tone production. Repeated measures ANOVA were performed with significance at $p<0.05$.

Results

For all tasks, the mean normalized EMGs of FDS, EDC, BB, TB, and DT were clearly smaller during playing their own violin. In particular, for the professional violinists, the difference of muscle activity was obvious in EDC and DT during the scale task.

Conclusions

The violinists changed the muscle activity of the right hand. In particular, professional violinists changed some muscle activity rather than the whole right hand.

Keywords

violin; EMG; muscle; right hand; bowing

PRE-COMPETITIVE APPRAISAL, PERFORMANCE ANXIETY, AND CONFIDENCE IN CONSERVATORIUM MUSIC STUDENTS

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Background

Precompetitive appraisal determines the type of emotion an athlete experiences with regard to an upcoming competition. According to Lazarus' Cognitive-Motivational-Relational Theory, interpreting a performance as a threat or challenge can result in emotions which exert powerful and potentially destructive consequences on performance. Similarly, poor self-efficacy beliefs and intense performance anxiety can negatively affect music performance out-

comes. There is no published research specifically examining the relationship of precompetitive appraisal, performance anxiety, and self-confidence in musicians.

Aims

This study aimed to address this shortfall by investigating the appraisals musicians have in relation to a competitive performance. Specifically, threat perceptions were hypothesized to be associated with significantly greater anxiety than challenge perceptions. Challenge perceptions were hypothesized to be associated with significantly greater self-confidence than threat perceptions. Associations between the two appraisal constellations and performance outcomes were also explored.

Method

Thirty-six first year Bachelor of Music students volunteered to participate in a two-stage assessment process. At the start of semester, students completed the Precompetitive Appraisal Measure and Competitive State Anxiety Inventory–2R with added facilitating-debilitating dimensional scales in relation to their end of semester performance assessment/recital. They then completed the same two measures again, approximately one hour before performing in their end of semester performance assessment/recital.

Results

Cluster analysis of Primary Appraisal (3 items: importance, harm, and benefit of performance) and Secondary Appraisal (4 items: coping resources) Performance Appraisal Measure subscale scores revealed reliable constellations of threat and challenge perceptions. Secondary Appraisal was significantly lower than Primary Appraisal for students who perceived the upcoming performance as a threat. Compared with students who perceived performances as a threat, students with challenge appraisals had significantly less cognitive anxiety, and significantly greater self-confidence both at the start of semester and pre-recital.

Conclusions

We have initial evidence that theoretically-derived constellations of performance threat and challenge vary with performance anxiety and self-confidence. Secondary Appraisal had a particularly strong influence on these emotion-related effects, suggesting that this four-item subscale of the Performance Appraisal Measure may be a quick and reliable tool to identify tertiary music students who are most in need of pre-performance intervention strategies to manage performance stress under pressure.

Keywords

musicians; performance anxiety; self-confidence; threat perception; challenge perception

NEURAL AND MUSIC CORRELATES OF MUSIC-EVOKED EMOTIONS

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Background

One of the basic research interests in the cognitive neuroscience of music comes from the affective phenomena that take place while playing and listening to music. The relationship between music and emotional states has been studied in depth in the context of various disciplines, while the implications of such findings concern many areas, from philosophy and music theory to composition and performance. Several neuroimaging studies have shown distinct spatial patterns of activity that emerge from brain structures, already known to be involved in emotions. From the musicological point of view, there has been a strong tendency in the aesthetics of music to emphasize the importance of musical structure and its underlying features.

Aims

The aim of this work is to investigate the neural correlates of music and basic emotions. Although there are many descriptive theories regarding this connection, our aim is to predict specific brain activations based on acoustic features extracted from music audio signals. In particular, we investigate the correlation of different types of acoustic (i.e. melodic, harmonic, rhythmical, timbre) features to brain activity, and apply machine learning techniques to obtain a computational predictive model of brain activation produced by music with emotional content.

Method

The brain activation model is learnt by applying machine learning techniques to fMRI data obtained from 17 individuals during a listening session of 24 tracks (8 joy, 8 fear, and 8 neutral stimuli). The brain activity in every voxel is predicted by the learnt model based on a set of acoustic descriptors extracted from the music tracks' audio. Separate linear models are trained for each of the 17 participants using a multivariate approach, and evaluated by matching the observed and predicted fMRI images of test stimuli that belong to different emotional classes ("leave-two-out" cross validation). Alternative sets of acoustic features are compared in terms of their accuracies to predict brain activity in specific brain regions.

Results

The evaluation of the models was performed for each of the 17 participants independently. The cross-validated accuracies were significantly higher for descriptors that were selected based on literature review and fMRI BOLD signal correlation, in comparison to distribution of accuracies of random selected features. Specifically, descriptors based on literature obtained an average prediction rate of 93.35% (SD=0.03) for voxel selection using t-tests, while descriptors based on fMRI correlation resulted in an average rate of 87.53% (SD=0.07). Individual predictive accuracies for each pair of conditions showed that brain activations produced by joy and neutral tracks were harder to differentiate than those produced by fear and joy, and by fear and neutral tracks.

Conclusions

Moving away from a descriptive theory of music-evoked emotions, we have been able to build predictive models of fMRI activity produced by musical stimuli, potentially moving towards a theory of neural representations. As a restricted form of predictive theory, this could answer how specific features (i.e. rhythmic, melodic, harmonic, and timbric) correspond to individual components of neural activation.

Keywords

music; emotions; brain activity; fMRI; machine learning

Acknowledgements

LISTENERS PREFER EDITED STUDIO RECORDINGS THAN LIVE RECORDINGS

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Background

In a previous study Shoda and Adachi asked 153 listeners to compare Schumman's *Traümerei* recordings performed by 13 pianists, with and without the presence of an audience. Results showed that musicians performed their best in front of an audience. However, previous research observed that recording producers across musical genres use interpersonal and communication skills to compensate for the lack of audience by playing an intermediary role between the artists and their future audience; they inspire performers to take risks in the studio and then edit the most magical takes together. A jazz studio experiment by Pras and Guastavino also demonstrated that producers help musicians improve from one take to another, and that they enhance objectivity and creativity in the studio.

Aims

This study extends Shoda and Adachi's research by adding artistic direction and editing for the recordings without the presence of an audience. This experimental procedure aims to highlight the contribution of recording producers in the success of studio recordings.

Method

Two students from the Advanced music production program of the Paris Conservatoire produced recordings of a six-dance baroque suite and a four-movement romantic sonata performed by alumni and current students of the Con-

servatoire, with and without the presence of an audience. Three versions of each dance/movement were created, i.e. a live concert performance, a first studio take, and an edited studio version.

Twenty listeners with a relevant expertise in classical music picked their favorite version for 48 baroque dances and 25 romantic movements, thus providing us with a total of 73 choices. They explained their preference for 58 out of the 73 choices, from which we extracted 93 phrasings that we classified into six music criteria.

Results

Combining the dances/movements, listeners preferred the edited versions (44%) more often than the first studio takes (29%) and the live concert performances (27%). The distribution of listeners' preferences shows that they tend to prefer the studio versions (first take and editing) vs. the live recordings for the romantic sonata, while they tend to prefer the edited versions and the live recordings vs. the first studio take for the baroque suite.

We found three predominant music criteria for listeners' preferences that were almost evenly distributed among all three versions, namely Expression, Tempo, and Precision. The criterion Balance among the instruments mainly appeared for the edited studio versions. The criteria Coherence and Naturalness were mainly found for the concert versions.

Conclusions

Results contradict a common belief that a live recording conveys a more expressive musical performance than a technically flawless studio production. Listeners almost equally preferred the live recordings and the first studio takes, which contrasts with Shoda and Adachi's findings that listeners significantly preferred performances recorded with the presence of an audience. This contrast confirms the capacity of recording producers to compensate for the absence of an audience, even though they need to listen to the takes in the control room so they cannot be physically present with the musicians during their performances.

Keywords

live performance; studio recording; recording producer; editing; classical music

BIMANUAL SYNCHRONY IN THE CONCILIATION OF FAST AND ACCURATE MOVEMENTS DEMANDED IN GUITAR PERFORMANCE

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Background

According to the theory of the formativeness of Luigi Pareyson, physicality is an essential condition for factual artistic performance to happen. Under this theory the artistic performance is primarily an action and a doing. In his work dedicated to the study of musical excellence, Williamon emphasizes that although the musical performance depends of agility and mental abilities, it is only through the physical component that the expression of musical ideas reaches its effective realization. Among the various skills required for musical performance, the development of motor skills is subject to the ubiquitous nature of the phenomenon of the speed-accuracy trade-off. Submitted to such a phenomenon, instrumentalist musicians, when in practice, need to negotiate between getting more speed of their body movements at the cost of decreasing the precision in the accomplishment of the task or in other way, increase the precision of the task at the cost of slowing down the performance of the same task. In their performative practices, in general, they seek a condition of conciliation between speed and precision of their motor action so that their performances are satisfactory.

Aims

To analyze the biomechanical factors involved in the conciliation of fast bimanual movements with the precision of the tasks demanded in the musical performance of guitar.

Main contribution

The biomechanical studies in musical performance already performed do not yet approach the bimanual synchrony in the analysis of the ability to conciliate speed-accuracy as an essential condition for the performance of the guitar. When discussing the conciliation of fast and accurate movements in simultaneous action of both hands in the practice of guitar performance the present study contributes in a singular and challenging way.

Implications

To deal with the phenomenon of speed-accuracy trade-off, the performance of the guitar presents an additional complexity regarding the synchronism of movements between both hands, a condition that requires in most cases different types of individuated movements for each of the hands. The present study attempts to insert the phenomenon of speed-accuracy trade-off in the real world of guitar performance witch implies to considering the need to conciliate motor speed and accuracy of the task as an element of the concrete reality of the world of instrumental music performance. Additionally, it considers the specific complexity of the guitar performance involved in the bimanual synchronism. Musical instrumentalists need a high degree of skill in to conciliate the speed of hand/finger movements with the precision with which the tasks are performed. In the case of guitar performance, it is necessary to develop a high level of bimanual synchronization to avoid inconsistencies in the temporal and spatial precision of the tasks and the speed with which they are performed.

Keywords

speed-accuracy trade-off; bimanual synchronization; guitar performance; performance physicality

Acknowledgments

MUSIC PERFORMANCE AS THERAPY FOR TERMINALLY ILL PATIENTS: AN EEG STUDY

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Background

Music performances are known to have the power to induce strong emotions. Given the right conditions they may even improve cognitive, social, and emotional abilities. Thus, a variety of clinical conditions are often treated with music therapy. However, there is often little research involving quantitative methods to assess the effectiveness of music therapy interventions for terminally ill patients. Recent reviews point out the need to provide an evidence-based rationale for music therapy clinical treatments in this field. The present study assesses, based on EEG data, the emotional response of terminally ill cancer patients to a music therapy intervention in a randomized controlled trial.

Aims

The objective of this work is to quantify the emotional effect of music therapy sessions in advanced cancer patients. With this aim, the patients' emotional state is decoded from their brain activity, detected as EEG data. EEG activity is measured before, during, and after the sessions in order to quantify the effect of both the general effect of the music therapy sessions, as well as the individual effect of different music therapy techniques.

Method

A sample of 40 participants from a palliative care unit in the Hospital del Mar in Barcelona is randomized and assigned to two groups of 20 patients. The first group participates in a session of music therapy, and the second group is provided with company. The participants' EEG activity is recorded before, during, and after the sessions using a 14 channel low-cost EEG device and analyzed using the Matlab programming language. Based on our previous work on emotion detection, emotional indicators in the form of a coordinate in the arousal-valence plane are extracted from the participants' EEG data. The emotional indicators are analyzed in order to quantify (1) the overall emotional effect of music therapy on the patients compared to controls and (2) the relative effect of the different music therapy techniques applied during each session.

Results

During each music therapy session, five conditions have been considered: I (initial patient's state before MT starts), C1 (passive listening), C2 (active listening), V (visualization), and F (final patient's state). The analysis of preliminary data has shown a statistically significant positive arousal difference between I and C2 (p=0.016) and a significant positive valence difference between I and F (p=0.0009). No significant differences were found in the control group.

Conclusions

Preliminary results show that music therapy has a positive emotional effect on advanced cancer patients. The analysis of the EEG data shows a significant positive difference of the patients' valence states at the end of the music therapy sessions with respect to their states at the beginning of the sessions. This result can be interpreted as a positive emotional effect of music therapy in advanced cancer patients. To the best of our knowledge, this study is the first clinical randomized controlled trial worldwide to systematically examine the emotional effects of music therapy in palliative care using brain activity information.

Keywords

music therapy; emotions; brain activity; EEG; cancer

Acknowledgments

EVALUATING THE EFFECTIVENESS OF A SELF-ESTEEM TOOLBOX WORKSHOP FOR ARTISTS TO IMPROVE SELF-ESTEEM AND ENHANCE PERFORMANCE AND CREATIVITY

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Background

The world of professional performing and creative artists is replete with challenges that can seriously undermine an individual's sense of self-esteem. Rigorous mental and physical training and exceptionally high standards of performance and creativity foster an atmosphere of chronic tension and pressure. As collaborative interdisciplinary health care practitioners in a unique facility treating only artists, we have observed that many artists' and performers' health issues are related to high stress and that an individual's attitude and approach, including their self-esteem, not only impacts their health but also their ability to create and perform. Although the interrelationship of self-esteem to self-efficacy and general competency is recognized in the literature, there are few concrete suggestions regarding the management of multiple stressors. In order to address this knowledge gap, we designed the "Building Confidence and Self-Esteem Toolbox Workshop" to provide participants an opportunity to examine and transform their self-concept and provide tools to develop and maintain this new self-confidence and healthy self-esteem.

Aims

This study evaluated the effectiveness of "The Building Confidence and Self Esteem Toolbox Workshop" to increase and maintain self-esteem, and to investigate the long-term effectiveness of the tools utilized within the workshop.

Method

Participants were recruited from two workshops. Each was six hours in length and randomly offered to the first 20 attendees who identified as professional artists. Informed consent was obtained from all participants and ethics approval was obtained from the University Health Network Research Ethics Board. Concurrent Triangulation Strategy Mixed Methods Design was followed, in which quantitative and qualitative data were collected. A validated questionnaire, "Self-Esteem Checkup" which quantifies participants' current perception of their self-esteem, was analyzed by repeated measures ANOVA test pre- and post-workshop and at two, six, and twelve months. Statistical significance was considered $p < 0.05$. The qualitative research included open ended questions and interviews which were held with a subset of randomly selected participants at six months post workshop. Qualitative data were reviewed and categorized into common themes.

Results

A total of 35 attendees consented to participate with 26 participants completing all phases and whose data were used in the final analysis. Each study participant was followed over five time points. Questionnaire responses revealed that the workshop had a statistically significantly positive effect on self-reported self-esteem scores. Qualitative analysis

revealed four primary themes emerging from participants' responses with positive comments in these theme areas. The themes included: Group setting, Integrative Culminating Experience, Transformational Learning Experience, and Positive Impact on Performance and Creativity.

Conclusions

This study demonstrated that there was an improvement in artists' self-esteem after participation in the "Building Confidence and Self-Esteem Toolbox Workshop," both immediately after and at twelve months post-workshop. The interviews identified a number of themes including positive impact on performance and creativity. Further study is recommended to replicate, validate, and expand on these findings.

Keywords

self-esteem; performance; artists; workshop; transformation

SUBSEQUENT IDENTIFICATION OF THE PROCESS MODEL OF ASSESSING MUSICAL PERFORMANCE BY MCPHERSON & THOMPSON (1998) IN A STUDY ON QUALITY OF INSTRUMENTAL PERFORMANCE AND MUSIC PERFORMANCE ANXIETY

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Background

This research project aimed at investigating the relationship between the quality of instrumental performance of the orchestral excerpt from Claude Debussy's *Prélude à l'après-mid d'un faune* and levels of music performance anxiety experienced by undergraduate flute students. The design took into account recent literature on music performance anxiety as well as our empirical knowledge of musical performance assessment procedures and tests. Considering that McPherson and Thompson discuss some of the essential characteristics for the assessment of musical performance results, we ask: What is the degree of similarity between the mentioned study and the proposed Process Model of Assessing Musical Performance by McPherson and Thompson?

Aims

This paper aims at identifying the similar characteristics of the Process Model of Assessing Musical Performance by McPherson and Thompson in a study on the quality of instrumental performance and music performance anxiety.

Method

The methodology is based on content analysis established through comparison between the characteristics of the Process Model of Assessing Musical Performance by McPherson and Thompson and those applied throughout a study on the quality of instrumental performance and music performance anxiety.

Results

We've established concordances between the theoretical background and the semi-experimental investigation. The first topic refers to the performance context consisted of four factors; the research comprised an individual practice session followed by an audition simulation. The subjects had to perform a previously rehearsed four-measure segment of the orchestral excerpt for flute from the *Prélude à l'après-midi d'un faune* by Debussy, which was considered a solo activity. The undergraduate flute students were very familiar with their respective musical performance environments, but they were not as comfortable in front of the recorder. The second topic refers to the influence on performance and assessment by musical and non-musical factors. The unaccompanied flute solo required an intermediate level of motor dexterity due to the slow tempo and the melodic structure. On the other hand, we found no non-musical factors influenced the outcome. The third factor refers to the effect of the personal characteristics of the performer, as well as of the evaluator on the musical performance. Therefore, we sought to identify the influence of the music performance anxiety on the quality of instrumental performance. However, we did not measure emotional states of the evaluators while assessing the musical performances. The fourth factor refers to the purpose of evaluation, which was comprised of twelve technical and interpretive skills of flute playing as assessment criteria for an audition, and by a Flute Performance Rating Scale developed from a survey conducted by Sinico and Gerling.

Conclusions

This study allowed us to compare and identify a high degree of similarity between the three factors associated with music performance anxiety–person, task, and situation–as well as of our empirical knowledge of musical performance assessment and the Process Model of Assessing Musical Performance by McPherson and Thompson.

Keywords

assessing musical performance; quality of instrumental performance; music performance anxiety; undergraduate flute student; *Prélude à l'après-midi d'un faune*

EXPERIENCE, ATTITUDES TOWARDS, AND KNOWLEDGE OF PLAYING-RELATED INJURIES AMONG SYMPHONY ORCHESTRA STRING PLAYERS: A QUESTIONNAIRE-BASED SURVEY OF LONDON SYMPHONY ORCHESTRAS

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Background

The first major survey investigating the impact of medical problems amongst professional musicians was undertaken in 1988 on 2,212 orchestral players in the USA. It revealed that 82% had suffered a playing-related medical problem, with 76% experiencing at least one severely affecting their performance. The highest prevalence of such medical problems was in string players.

Aims

To assess any changes in the prevalence and severity of playing-related morbidity amongst orchestral string players since publication of the aforementioned survey and investigate the experiences, attitudes, and knowledge of these musicians regarding playing-related injuries and their prevention.

Method

A self-completion questionnaire comprising three parts ("Experience...," "Attitudes towards...," and "Knowledge of playing-related injuries and their prevention") was distributed to 292 players in the string sections (violin I, violin II, viola, 'cello, double bass) of five London-based symphony orchestras: LSO, BBC Symphony Orchestra, RPO, LPO, and Philharmonia Orchestra. A total of 137 players (65 violinists, 30 violists, 23 'cellists, 15 double bassists, 4 not stated) returned the questionnaire.

Results

Prevalence of pain or discomfort when playing was 88.2%, with 39.8% of respondents experiencing it daily, 23.5% weekly, and 36.7% monthly. 'Cellists and violists (95.5% and 93.3% respectively) were the most affected and there was a higher prevalence in females (p=0.026). 62.8% of respondents stated they had suffered a playing-related injury, with 46.3% suffering an injury severely affecting their ability to play and 39.7% having to stop playing as a result (50% of these players for less than one month, 37.5% for 1 to 3 months, 8.3% for 3 to 6 months). Injury was more common in females and there was a higher occurrence in 'cellists, with 84.2% affected (p=0.034). 66.2% of respondents considered a degree of pain and discomfort to be an inevitable consequence of playing, a view held significantly more by those who experience such symptoms, have suffered a playing-related injury, or a playing-related injury severely affecting their ability to play. 90.5% of respondents stated the topic of playing-related injury was not taken seriously enough at music college. Respectively, 75.6% and 67.9% stated they had not received information and advice on playing-related injuries while at music college or as a professional orchestral musician, yet 85.2% and 69.4%, respectively, would have liked more. 68.1% of respondents were able to name a specific injury, 43.8% three ways in which to minimize injury risk while practicing, and 98.3% a method of injury prevention, with 73.7% stating they actively undertake injury prevention.

Conclusions

This represents the largest and most comprehensive study of its kind in the UK, gaining unprecedented access to the capital's leading symphony orchestras. The responses unfortunately show no improvement in the prevalence of pain and injury among orchestral string players, highlighting the ongoing importance of research within Music Performance Science and improved education at all stages of musical training and professional life to increase knowledge and awareness of playing-related injuries, their causes, and prevention. This will lead to the development of strate-

gies for enhancing the quality and longevity of healthy musical performance for the fulfilment of performers and audiences alike.

Keywords

orchestra; strings; injury; pain; prevention

PRELIMINARY INVESTIGATION OF EXECUTIVE AND MOTOR FUNCTIONS OF BEGINNING OLDER ADULT INSTRUMENTALISTS

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Background

Aging is associated with a decrease in performance on a number of motor abilities, including reaction time, movement time, and ability to adapt to external forces. Despite the ubiquity of these changes, little is known about how to moderate these effects. Finger tapping is a skill frequently assessed as a measure of fine motor skill. Age-related declines have been demonstrated for a variety of tapping and key-pressing tasks. However, older adults who had studied music as a child performed significantly better on tapping tasks, both unimanual and bimanual, than older adults who did not have instrumental training as a child. These behavioral differences are supported at the neurological level by evidence of neurological differences between adult musicians and non-musicians.

Older adults have rich and varied musical lives. The importance of music in the lives of senior citizens includes keeping the mind sharp, creating a sense of accomplishment, improving aerobic capacity, fun and enjoyment, relieving stress, and increasing activity level. In addition, some older adults return to play instruments they had not played since adolescence, choose to learn new genres of music, and participate in multiple ensembles.

Aims

Despite the strong presence of music in the lives of older adults, it is only recently that investigators have begun to document emotional, neurological, and behavioral benefits of musical study for older adults. The purpose of this investigation was to examine changes in fine motor skills and cognitive flexibility by community-dwelling adults over the age of 60, who participated in 8-12 weeks of private piano lessons.

Method

Participants (n=9) were community-dwelling adults age 60 and older, in the southeast United States. They completed an interview about their music experiences while growing up. In the first study session, they completed a working memory test (digit span forward), a cognitive flexibility test (Trail Making A and B), a music aptitude assessment (Gordon Advanced Measures of Audiation), and a series of 12 fine motor skill tasks (Bruininks Motor Ability Test for adults 40+ years). Next, participants attended 8-12 weeks of private piano lessons using a commercially available lesson book for older adults and supplementary materials prepared by the researcher. Participants agreed to practice about three hours a week at home, and the amount of practice time was recorded in weekly practice logs. In the final study session, participants repeated the pretest assessments.

Results

This study is currently in the data analysis stage. Descriptive and non-parametric tests will compare pretest scores to post-intervention scores on working memory, cognitive flexibility, music aptitude, and fine motor skills. Individual scores will also be examined in relation to age norms.

Conclusions

Results will be situated in previous literature and recommendations will be made for more extensive studies than this pilot study. Previous literature is available examining the impact of piano lessons for older adults on a variety of working memory tests and emotional tests, but none of these studies have included a standardized fine motor skill assessment.

Keywords

music; older adults; lifelong learning; piano practice; fine motor skills

RHYTHMIC CHARACTERISTICS OF SONGS CREATED BY YOUNG CHILDREN

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Background

Since the early 20th century, Japan has been quick to embrace Western music. As a result, most of the songs known by Japanese children today have been influenced by Western music or are the result of adding Japanese lyrics to the melodies of non-Japanese songs. Many modern songs produced by adults and the mass media are quite different from the traditional *warabe uta* (nursery rhymes) that Japanese children have been singing for centuries. Under these circumstances, progress is not being made on research related to when children naturally start singing and how they incorporate the words they want to say into their songs.

Aims

Using surveys and audio analysis, I examined the vocal characteristics of the lyrics and melodies of improvised songs created by four 5-to-6-year-olds I interviewed.

Method

Using pitch contours and spectral analysis, I divided the songs I collected into lyrical and melodic components.

Results

I found that onomatopoeia was common in song lyrics, sounds were extended, and the pitch often rose at the end of a word.

Conclusions

One could say that sustained vocal tones and rising pitches were defining characteristics of the songs I examined. Furthermore, high pitches, wide vocal ranges, and vocal resonance may be affecting my decision of what corresponds to a song's melodic components. However, I also observed that the lyrical and melodic characteristics of children's songs were mixed together.

Keywords

children's singing voice; linguistic rhythm; pitch; expression; improvisation

A STUDY OF PIANO TECHNICAL PROFICIENCY AND EXTENSOR DIGITORUM MUSCLE RELAXATION TIME RATE: COMPARISON BETWEEN PROFESSIONAL PIANISTS, MUSIC COLLEGE STUDENTS, AND INTERMEDIATE STUDENTS

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Background

Professional pianists are able to continuously practice with high intensity and speed daily for long hours and not develop myositis. However, most students are unable to do so because of the development of myositis in their fore-arms. To prevent muscle fatigue, muscle activity during piano keystrokes must be assessed.

Aims

We measured the relaxation time of the extensor digitorum of 11 participants by using electromyography (EMG) and compared it with their technical proficiency. The piano proficiency level is evaluated in terms of the artistic expression factor and technical performance factor. Artistic expression is ascribed to a great understanding of art based on sufficient knowledge, advanced technique of music composition, and excellent music sense. In our study, to evaluate piano technical proficiency (not artistic expression) we evaluated the keystroke timing and intensity of sounds.

Method

The sounds and EMG signals were recorded simultaneously by using a data logger. The Boston Grand Piano 193 was used in this study. Participants included three professional pianists, five music college students (i.e. semiprofessional pianists), and three intermediate students. The participants attached the EMG sensors on the extensor digitorum of their right arm and the following musical scores were played: Sound 1 (S1) was a "fa" in the highest possible intensity and Sound 2 (S2) was a "do, re, mi, fa, sol, fa, mi, re, do." Each note was played at a uniform pace and at a high intensity. These sounds were analyzed and evaluated objectively and numerically based on the following three factors: F_A, the maximum sound pressure of S1; F_B, the standard deviation of the maximum sound pressure of S2; and F_C, the standard deviation of keystroke timing of S2. The sound evaluation index, E, was defined as the sum of E_A, E_B, and E_C, which are the evaluated values of F_A, F_B, and F_C, respectively.

The EMG was rectified and smoothed, and the rates of the muscle relaxation time were measured. We determined that the muscle was relaxed when the EMG value was below the threshold line, which is at 40% of the maximum integrated EMG of each participant. These rates of relaxation and contraction of each participant's muscle were compared with the evaluation index, E, of their sound performance.

Results

The average values of E for the professional pianists, music college students, and intermediate students were 2.72, 2.49, and 2.42, respectively. The average values of muscle relaxation time rates were 94.2%, 83.5%, and 69.0%. The muscle relaxation time rate augmented with an increase in the technical playing level of the pianists. The correlation coefficient between the muscle relaxation time rate and the E value was 0.80. Additionally, we found that the extensor digitorum muscle of a professional pianist was relaxed with each keystroke.

Conclusions

We clarified the correlation between the muscle relaxation time rate and piano technical proficiency. To prevent myositis in piano students, the muscle relaxation time rate needs to be increased.

Keywords

piano keystroke; proficiency; technical playing level; EMG; relaxation time

AN EXPLORATION OF THE PROCESS OF GROUP SINGING FOR MALE CANCER PATIENTS: A PHENOMENOLOGICAL STUDY

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Background

Cancer is one of the world's leading causes of death and one of the biggest challenges to the healthcare system, society, economy, and to medical research. It is a challenge to find effective treatments for patients, but there is also a further challenge around delivering holistic healthcare that will provide psychosocial support. In recent years as arts-in-health research has flourished, a few studies have emerged exploring how group singing may be able to provide such support. Results have been promising, including improvements to wellbeing, quality of life, and to mental health, as well as inciting biological signs of stress reduction. However, there is a gender bias toward female participants and no research has specifically focused on singing for men. Furthermore, previous research which looks at singing and cancer has focused on the product of singing, exploring its impact and how it effects health change; there is little research focusing on understanding the actual processes by which singing makes these changes. This raises questions such as: how do male cancer patients *experience* group singing? What meaning does the *process* of singing have for male patients? What part does the individual play in *developing* and *delivering* a choir?

Aims

The aim of this research was to explore how men with cancer experience the process of participating in weekly singing. Through the lens of phenomenology, it was the intention to work inductively from interview data and to place the participant at the center of the research process.

Method

An immersive, qualitative project was conducted. Semi-structured interviews were carried out with 5 male participants with prostate cancer, lasting up to 60 minutes each, transcribed verbatim and then analyzed using Interpreta-

tive Phenomenological Analysis. Questions included exploring the participants' experience of cancer, group singing and how the singing process may impact upon the lived experience of having cancer. This approach allowed for immersion in participants' experiences and themes were drawn inductively from transcripts. In addition, a researcher journal was created in order to document researcher experiences and to reinforce the validity of the study.

Results

Five superordinate themes and sixteen subthemes emerged from the analysis procedure, each of which describes the process of group singing and, in some cases, the choir's subjective impact: (1) meeting existential changes; (2) dynamic connection to others; (3) a holistic experience; (4) a positive experience; and (5) potential barriers.

Conclusions

This study is the first to explore the process of group singing for male cancer patients. The results could improve our understanding of the subjective experience of singing for patients, helping to provide insight into holistic healthcare, evaluate current choirs for those affected by cancer, and to optimize service delivery.

Keywords

singing; cancer; arts-in-health; phenomenology; interview study

EXPOSURE AND NOT TITLES AID NON-MUSICIANS' MEMORY FOR CONTEMPORARY MUSIC

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Background

In attracting new audiences for contemporary music repertoire, it is important to determine how listeners remember and come to enjoy a piece of new music. Repetition and liking are related such that listeners like a piece of music they can remember and consequently remember pieces of music that they like. Mere exposure can increase memory for unfamiliar music, but liking reaches satiation after a large number of repeated exposures to ecological stimuli. Memory and liking are also related to perceptual fluency. Presence of titles or background information may aid perception and enjoyment of music; however, program notes have been shown to reduce non-musicians' enjoyment of string quartets. Studies on memory for music have largely considered the recognition of unfamiliar tonal music, where structures and harmonic relationships are relatively easier to process than in contemporary atonal classical pieces, for which the structure may be more ambiguous.

Aims

To determine the extent to which exposure and titling information affects the memory of unfamiliar contemporary classical music for non-musicians.

Method

64 excerpts were selected covering different instrumentation (piano, violin and piano, flute and piano, wind ensemble). 23 non-musicians (defined as those with no or less than 1 year of musical training) participated in a two-session experiment, one day apart. On Day 1, participants were exposed to 32, 15-second excerpts of contemporary classical music, controlling for the exposure rate (one or three exposures), and titling information (none, descriptive, semantic, affective). All excerpts were presented in a random order. One-sentence titles were presented on screen for 5 seconds duration after presentation of the audio excerpt. Participants were asked to respond whether they had heard the excerpt previously in the experiment, and how much they liked the excerpt on a 7-item Likert scale. On Day 2, participants were presented with the 32 "old" and 32 "new" excerpts in a random order and asked again to rate their recognition and liking of each. No titles were presented on Day 2, to ensure recognition rates were for the music and not for the text.

Results

Accounting for response bias, participants were able to recognize all "old" excerpts on Day 2 significantly better than chance. Two-way ANOVA analysis showed a significant main effect of exposure on recognition rate ($F_{1,22}=87.72$, $p<0.01$). No other interactions or main effects were significant. Further investigation showed no influence of liking ratings at first presentation, music excerpt or instrument on Day 2 recognition.

Conclusions

Non-musicians can remember contemporary classical music, and memory is increased by repeated exposure, in line with the mere exposure effect. There appears to be no effect of title information being present at encoding, and no influence on how much the music is liked initially on the ability to recognize the piece at a later date.

Keywords

memory; exposure; titles; contemporary music

Thematic session
Self-regulation

EFFECTS OF A SELF-REGULATION WORKSHEET ON THE SELF-REGULATORY BEHAVIOR, SELF-EFFICACY, AND PERFORMANCE OF NOVICE ADULT MUSICIANS

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Background

Within the music domain specifically, the advantages of applying sophisticated self-regulatory strategies when practicing have been repeatedly demonstrated. Additionally, novice performers have been shown to lack key self-regulatory skills. Despite the convincing evidence that self-regulation enhances learning in music, there have been few intervention studies designed to enhance learners' use of self-regulatory processes. In sport, Zimmerman and colleagues proposed a three-stage learning strategy involving the setting of process goals, the recording of performance, and strategic self-reflection, which may provide a more effective guide to self-regulation for music students.

Aims

This study aims to examine influencing self-regulated learning in novice adult instrumentalists through an intervention that uses guided, structured practice.

Method

Twenty-two individuals naïve to learning a string instrument were recruited to undergo teaching in weekly, one-hour group instrumental lessons. Thirteen participants (10 female, 3 male; 4 from the placebo group and 9 from the intervention group) completed the final assessment and were included in the analysis. All students received the same teaching, whereas some followed a guided practice routine and others did not.

Results

Participants were recommended to practice for a total of 15 minutes per session, four times per week (total=540 minutes). Adherence to these guidelines varied widely, from a low of 137 minutes to a high of 1060 minutes across the eight weeks of the program. The total amount of practice reported by participants in the placebo group (Median=792.5 minutes, IQR=450 minutes) was considerably higher than that reported by the intervention group (Median=290 minutes, IQR=623 minutes). While the p-value for the comparison of practice duration was marginally greater than 0.05 (z=1.86, r=0.51, p=0.064), given the large effect size, and the fact that all participants in the placebo group exceeded the recommended 540 minutes total practice while five participants in the intervention group compiled total practice minutes of less than half of the recommendation, it appears appropriate to conclude that participants in the placebo group engaged in substantially more practice than participants in the intervention group.

Conclusions

The analysis of the practice self-record sheets and exit interviews indicated that the intervention was successful in promoting self-regulatory behaviors. The worksheet may prove more beneficial to musicians who are already familiar with technique on the instrument. While the effectiveness of the intervention was identified, many participants objected to the process. Further consideration of how self-regulation instruction can be successfully integrated into teaching practices is warranted. Future research should consider both the content of interventions, and the research designs used to evaluate the effectiveness of such interventions.

Keywords

self-regulation; practice; adult learning; music; performance

THE USE OF MICROANALYSIS AS AN INNOVATIVE TOOL FOR IMPROVING MUSICIANS' SELF-REGULATED LEARNING AND PRACTICE EFFICIENCY

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Background

This paper describes the development of a music practice microanalysis protocol that is based on the three-phase model of self-regulated learning (i.e. Forethought, Performance, and Self-Reflection). Up until now, most studies on music practice have tended to focus on behavioral aspects. The expanded view presented here outlines a technique that focuses on the types of behaviors (actions), cognition (thoughts), and affect (feelings) that can help focus musicians' practice, and enable them to make improvements to the efficiency of their learning.

Aims

To develop a research and intervention tool reflecting the breadth of self-regulated learning strategies, and within-subject, moment-to-moment fluctuations in practice quality that determine the intensity and quality of practice within and across practice sessions.

Method

We conducted a two-stage research study: first, a baseline observational study; second, a practice intervention, involving seven first year Bachelor of Music students studying at a large University music school across two semesters as they prepare repertoire for their performance exams.

Results

The technique revealed students demonstrate broadly contrasting self-regulated learning profiles. It also informed an effective self-directed educational intervention to cue students to think about what they are doing and then reflect critically on the strategies they can use to improve their playing.

Conclusions

This flexible, working microanalytic protocol can inform educational interventions aimed at breaking the cycle of habits that typify musicians at this developmental stage, encouraging them to become more behaviorally, metacognitively, and emotionally involved in their own learning. This tool could be used to help musicians become more aware of their own practice efficiency, and an aid for teachers who wish to adopt the technique to improve their students' learning.

Keywords

self-regulated learning; musical development; practice; microanalysis; intervention

Acknowledgments

PERFORMING ON THE TOP OF ONE'S MUSICAL GAME

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Background

The contemporary musician is confronted with multiple psychological demands, hence tremendous internal and external expectations. Consequently, guidance on how to carry out instrumental practice effectively and how to psychologically prepare for performance is required. Self-regulated learning (SRL) has for more than two decades been applied as conceptual framework for research in instrumental practice. However, this body of research has mainly been concerned with exploratory aspects (e.g. to what degree music students are self-regulated, what self-regulation strategies music students apply during instrumental practice, and how one might facilitate self-regulated learning in children and adult music learners). Surprisingly, the statistical power of SRL's main conceptual model (i.e. the cyclical model of SRL) has not been explicitly tested with regard to instrumental practice. With this in mind, there is a need for research studies testing the statistical power of the cyclical model of SRL. In addition, more SRL intervention research providing music students with psychological prerequisites in an increasingly competitive work environment is needed.

Aims

(1) To test the predictability of an adapted model of self-regulated learning in the context of higher music education (N=204). (2) To investigate personal benefits, perceptions, and the effect of a 15-week sport psychological skills training program implemented within the frame of SRL. Combined, the overall research aims are to: (1) generate multidimensional knowledge regarding aspects affecting the effectiveness of music students' instrumental practice and performance, and (2) further develop the SRL framework in relation to challenges found within performance-related fields such as music and sports.

Method

(1) Survey study: Structural equation modeling (SEM) analysis. (2) Mixed methods intervention study: effect size (t-test and Wilcoxon's signed rank) and a triangulation of qualitative methods such as semi-structured interviews, a research log, and participants' diaries.

Results

Survey study: The study verified adaptive cyclical learning in the music students who were self-regulated learners. In essence, the three phases of the cyclical model of SRL predicted one another. The forethought phase constructs (i.e. goal setting, self-efficacy) seemed to play a key-role in music students subsequent SRL including use of self-observation, psychological skills, and adaptive coping in the face of failure.

Intervention study: Key findings from the survey study were corroborated more in depth. The facilitative role of planning and specific goal setting on adaptive cyclical SRL patterns and use of psychological skills was verified. Additionally, the psychological skills intervention increased students' ability to accept adversities and take chances, this in turn, reduced participants' worry and anxiety in performance situations. An 8-month follow up interview revealed that the participants were still actively applying psychological skills.

Conclusions

Combined, the present research reveals the effectiveness of both the implementation and application of principles from SRL and psychological skills in the field of music. In essence, the results yield that these two aspects should be further investigated in relation to one another. Moreover, the efficiency of SRL in music might be improved including psychological constructs addressing performance enhancement as part of the SRL model.

Keywords

self-regulated learning; psychological skills; deliberate practice; motivation

Thematic session
Modeling performance

LONG-TERM MONITORING OF TRUMPET PLAYERS' PERFORMANCE TO DOCUMENT THE SKILL ACQUISITION AND PSYCHOPHYSIOLOGICAL FACTORS OF MUSICIANS

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Background

Practicing is necessary to acquire artistic and fine motor skills for playing any musical instrument. Getting professional, the demands on physiological but also psychological aspects are even exceptional higher, but objective evidence of these proficiencies are difficult to measure and to compare. There are hard-to-tell levels to pass the entrance examination at music universities just as well the level to master the final exam concerts. While some teachers can partly follow the development of their students, there is no real documentation of the process of learning an instrument up to top professional level.

Aims

This project is an approach to document the development of trumpet players' skills using multiple measuring tools available at the Motion-Emotion-Lab. Establishing a test procedure is an important step, before the results can be included in the main research after collecting data through at least 5 years. The final aim is a multidimensional report of the variability of education patterns from the advanced beginner (age 12) through his studies (age 18-22) until his professional engagement.

Method

The monitoring system used in the Motion-Emotion-Lab consists of multiple components, focusing on different aspects. Some measurements can be done simultaneously and synchronously, like the Noraxon MyoResearch 3 System (MR3), which integrates and synchronizes multiple biomechanical assessment technologies under the umbrella of a single software system.

MR3 includes MyoMuscle (8-channel EMG of muscles involved for holding and breathing), MyoMotion (6-channel 3D Motion-Capturing of the torso, upper limbs, head), myoFORCE (high-res force plate), and MyoVideo (Audio-Video-recording). Additionally, a biosensor is monitoring heartrate, EKG, and breathing pattern. These bio-kinetic data acquisition allows the analysis of posture, motion, and psychophysiological aspects while playing given four music examples on the trumpet. Since the artistic creativity of the music is also taken into further analysis, it's important to mention that the players are free to any interpretation these tasks. A PONY FX Spirometer is used to reveal maximal exhalation pressure (MEP) while Sound Pressure Meter are used to measure maximal length some notes can be played. The Bonsai LiPr System is used to measure the pressure of the mouthpiece on the lips. Questionnaires are included to get data of educational and practicing aspects, as on personal aspects like an anxiety factor. Recording and analysis of maximal single, double, and triple-tonguing tempo, as on maximal playing ability of very loud and high notes are recorded.

Results

First tests have been successfully done with some (N=6) first-semester trumpet students. It could be shown that the demands and tasks can be fulfilled in 90-120 minutes. The Performance data show a huge variation of individual strength. Some Parameters will be excluded in further studies, since reproducibility is hard to achieve.

Conclusions

Documenting psychophysiological data of music performance is tricky, and many aspects and techniques have to be taken into account. The presentation of the engaged setup is fundamental to discuss further options of method improvements before gathering more long-term data. Cohort studies and 4-8-year longitudinal analysis are promising and can reveal new information for objective evidence on playing abilities and its variabilities.

A BOTTOM-UP MODEL OF IMMANENT ACCENT SALIENCE IN WESTERN ART MUSIC

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Background

The notes in a musical score are not equally important in music performance or in music perception. The musical structure (phrasing, meter, melody, harmony) makes some notes or groups of notes more important, thus appearing to be "accented."

In a previous study we presented a computational model of accent salience in Western tonal music by following a top-down approach. By combining the accent theory of Parncutt with the performance rendering system "Director Musices" of Friberg, Sundberg, and Bresin we estimated the positions and saliences of metrical, melodic, and harmonic accents separately, and compared our predictions with the results from two different experiments involving musicians and music theorists, respectively.

Aims

In this study, our model is being revised by following a bottom-up approach, and a new model of immanent accent salience is derived by means of machine learning from experimental data, rather than from purely theoretical principles. We also aimed at investigating whether perceived accents do arise through interaction of rhythmic, melodic, and metrical aspects, rather than from their independent contributions as assumed in previous research.

Method

A corpus of 60 melodic fragments was collected from 3 different Western art musical styles (Baroque, Romantic, and post-tonal), 30 vocal and 30 instrumental, each lasting 30s on average. The melodies were played by the computer without any performance variation on a midi-controlled Disklavier Yamaha C3pro grand piano, and recorded in audio format. They were presented to the participants in random order using a specifically developed computer interface, in which the audio was aligned to a corresponding MIDI piano roll display. Twenty-one amateur musicians participated in the study. For each melody, participants were asked to mark the most perceptually important notes on the screen, and to provide for each selected note a salience on a point-colored scale from 1 to 3. At the end of the task, participants were asked to fill in a questionnaire concerning their expertise, their familiarity with the melodies, and the strategies adopted for selection.

A relatively large number of basic local features related to the metrical, rhythmical, and melodic structure was defined, starting from previous studies. Several basic machine-learning methods were applied in order to predict the average ratings of the participants from the local features. The influences of both different features and musical styles were investigated.

Results

Preliminary results indicate that there is enough agreement among the raters to support an average across them. Thus, there exists a valid ground-truth to formulate a model. There is also evidence that a better model fit can be obtained by combining features from different categories (rhythmic, melodic, and metrical), rather than treating each category separately. Further results will be presented at the conference.

Conclusions

There is support that perception of immanent accents is influenced by the interaction of features derived from rhythmic, melodic, and metrical aspects, whose modeling and computer implementation can, in future, also improve

the quality of performance renderings. The results of the bottom-up approach will be compared with those of the top-down model, and discussed on the basis of the different musical styles considered in the study.

Keywords

musical accents; musical styles; director musices; machine learning

FOCUS OF ATTENTION IN WIND PERFORMANCE: SHOULD I THINK ABOUT MY FINGERS?

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Background

A musician has many choices of where to direct her attention while playing. The field of motor control has identified these possible areas as "focus of attention" (FOA). FOA can be directed internally (embouchure or fingers) or externally (keys or the sound of one's music). Previous research in motor learning and one piano study found an external FOA generally leads to more efficient and effective movement than an internal FOA. However, a recent study indicated university novice woodwind players were not differentially affected by internal and external FOAs, while the advanced players performed most evenly and accurately using an internal FOA.

Aims

The purpose of the current study was to examine the effect of FOA on second-year band students' performance. It extended existing literature by including a control condition and by examining performance on wind instruments instead of piano or voice.

Method

Participants were forty-nine band students in their second year of study, aged 13-14 years (n=25, woodwinds; n=14, valved brass; n=10, trombones). The design was repeated measures, including three experimental conditions of a control condition (no directed FOA), an internal focus condition (fingers, or right hand for trombones), and an external focus condition (sound). The study stimuli were isochronous, alternating two pitch patterns (e.g. eighth notes C-A-C-A-C-A-C). Participants were tested in individual study sessions, across two days. On Day 1, students heard a model recording of each stimulus at a specified tempo and were then directed to play the measure as evenly and accurately as possible (control condition), while "thinking about your fingers" (internal focus condition), and while "thinking about your sound" (external focus condition). Participants played eight trials of each three stimuli. The design was fully counterbalanced, with the exception that the control condition was always performed first. Approximately 24 hours after the first study session, participants returned for a retention test, playing each stimulus three times with no directed FOAs.

Results

Each of the 1,617 performance trials was scored for pitch accuracy and evenness. Results will be analyzed as within group ANOVAs (Day 1 vs. Day 2, in woodwinds, valved brass, and trombone) and between group ANOVAs (control vs. internal FOA vs. external FOA, in each instrument group).

Conclusions

Results will be discussed in reference to previous literature in motor learning, which favors the external focus of attention, and the limited studies in music FOA, which has shown a trend favoring an internal FOA. Implications for teaching and individual practice will be discussed.

Keywords

music performance; wind instrument; focus of attention; practice; music education

Thematic session
Synchrony and timing

A SYNCHRONIZATION TAPPING TASK REVEALS INSTRUMENT SPECIFIC FINE-MOTOR CONTROL OF FINGERS IN KEYBOARD, STRING, AND WOODWIND PLAYERS

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Background

The ability to accurately move two fingers in contrary directions is a prerequisite for many musicians. In skilled woodwind players, precise execution of "forked fingerings" is extremely important to avoid unpleasant side-noise, whereas such movements are less in other instrumentalists, such as string players. We therefore expected an "instrument-effect" when testing this in a tapping device allowing for precise monitoring of opposite finger movements.

Aims

We wanted to investigate whether instrument-specific skills generalize to simple motor patterns of skilled finger-movements in non-musical contexts.

Method

Eighty-two professional musicians or music students from Hannover Music University and thirty non-musicians were tested. The musicians comprised 23 pianists, 10 accordionists, 13 woodwinds, 11 violinists, and 15 bag-pipers from the Edinburgh conservatory. All subjects were right-handed, 52 female. Subjects were asked to touch a metal electrical conductor with one finger and at the same time lift another finger off a second conductor. They were instructed, that the change of fingers should be as precisely as possible. Each tests lasted 30s, the movements were made to a metronome at 120 beats per minute. Fourteen varieties of movements including different combinations of movements with index-, middle-, ring-, and little finger of both hands were recorded on each person; data files were analyzed using ANOVA.

Results

Generally, one finger touched before the other finger started to rise. This is referred to as "overlap." Occasionally one finger rose before the other finger touched down. This is referred to as "gaps." Variations between members of the same instrumental group were substantial. With respect to overlap-time (a perfect displacement of fingers would amount to an overlap of zero milliseconds) the bag-pipers were the most precise with an average overlap time across all tasks of 10ms. They were followed by woodwinds, with 30ms average in overlap, violinists with 42ms, pianists with 45ms and accordionists with 48ms mean overlap time. Non-musicians produced a considerably higher overlap with 70ms. These differences were highly significant (p<0.0001). With respect to differences in right- or left-hand performance, bag-pipers, woodwind-players, accordionists, and non-musicians showed no differences, although all were right-handed and a right-hand superiority was expected. The violinists showed in some of the 14 tasks a left hand superiority, which was statistically significant (p<0.007, paired t-test).

Conclusions

Our simple synchronization-tapping task revealed instrument specific differences in fine-motor control of individuated finger movements in various groups of instrumentalists and non-musicians. These differences most probably are either due to specific skills acquired due to acoustical parameters of the respective instrument, e.g. high energy in sound-onset time in bag-pipers when changing the fingering at the chanter, or to technical demands, e.g. requirement of fast phasic finger movements in the left hand of violinists as opposed to their right hand.

Keywords

motor control; musical instruments; tapping task; auditory-sensorimotor integration

LISTENERS' SENSITIVITY TO MICROTIMING DEVIATIONS IN SWING AND FUNK MUSIC

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Background

The magnitude of microtiming deviations and their effects on the experience of groove have been addressed in recent studies. The notion of microtiming magnitude as an absolute measure (e.g. in milliseconds) is precarious, however; performance analyses have shown that absolute microtiming magnitudes differ across musical contexts. This dependence on context makes it difficult to compare the results of microtiming-related groove studies.

Aims

This paper studies three different ways of quantifying expert performance microtiming deviations with the purpose of finding a measure that provokes consistent emotional listener reactions across two styles (swing and funk).

Method

Timing-manipulated music stimuli of 20s duration were presented to 160 participants during a listening experiment. The stimuli were created on the basis of two recorded professional duo studio performances in swing and funk style. For each stimulus, the timing was manipulated by scaling the performed microtemporal deviations relative to a regular grid. This grid was derived from a metronomic click track that the musicians heard while performing. The originally performed microtiming deviation magnitudes were scaled to a minimum of 0% (all onsets exactly on the grid) and to a maximum of 200% (deviation magnitudes doubled) in steps of 20%.

Listener reactions were collected using the Emotional Assessment of Groove (EAG) questionnaire with three scales (Entrainment, Enjoyment, Irritation) and the Self Assessment Manikin (SAM) with three scales (Valence, Arousal, Dominance).

Results

The experiment showed that listener reactions were inconsistent across styles ($t_{1745}=3.48$, $p<0.001$), when microtiming was measured as the Root Mean Squared Error of the timing deviations expressed in milliseconds. This style-dependent inconsistency was further augmented ($t_{1745}=4.62$, $p<0.001$), when the deviations were expressed as a proportion of the mean beat duration, which adjusted the microtiming measurements for different tempi. Listener reactions became consistent across styles ($t_{1745}=1.22$, $p=0.222$), when the timing deviations were expressed as a proportion of the mean inter-onset-interval, which adjusted the measurement for rhythmic density.

Conclusions

The results suggest that listener sensitivity to microtiming deviations may depend on the rhythmic density of the music. Based on the findings of this study, we hypothesize that listeners' emotional reactions to microtiming magnitudes are subject to Weber's law. This would imply that listeners' sensitivity to microtiming is a function of the proportion between the mean microtiming deviations and the mean inter-onset-interval. More research is required to validate the hypothesis by studying whether this paper's findings translate to other musical contexts (like other musical styles or instrumentations).

Keywords

microtiming; perception; sensitivity; funk; swing

TIME AS PROCESS (OR THE PACING OF MOTION) AND ITS DEMARCATION RUBATO: A MEANS TO "SHAPING" *ONDINE* BY DEBUSSY

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Background

The recognition of Time as Process is generally a neglected topic in the literature of musical performance, even though the pacing of motion–according to Epstein–occupies the highest level in the structural hierarchy in music. "Shape" too, or the "form" of a musical work is also rarely addressed by performers or pedagogues, and continues to be viewed as part of an "existing formal prototype," more commonly described as the surface patterning of the music, such as sonata form, binary, ternary, da capo, or introduction and coda etc. In this paper I propose that second element of Time, i.e., Process–or the pacing of motion and its demarcation *rubato*–are the critical elements which control the pacing of the ebb and flow, and thus the "shape" of *Ondine*, the eighth prelude from Book 2 by Debussy.

Aims

If Process and rubato ultimately contribute toward control of the pacing, and thus the "shape" of *Ondine* during performance, the question then arises: how? Using informal tools of analysis, I will construct a graph from Debussy's rubato markings to expose the motion of *Ondine*, as a continuous fluctuating wave, thus enabling the performer to pace and project the prelude in a "shape" which is both logical and coherent. To this end I will draw also upon research into Time by Epstein, Hudson's account of Debussy's use of rubato, and historical evidence by Schmitz amongst other contemporaries.

Main contribution

Issues concerning temporal matters scarcely feature in the body of pedagogical literature concerned with piano performance. Where the subject does arise, the terminology employed to describe it is often contradictory. For example, the Russian pedagogue Heinrich Neuhaus states emphatically that his piano students should be able to master the "most important aspect" of the music, which is the "rhythmic structure or ordering of the time process." The implication here is that the "rhythmic structure"–which is integral time–and the "time process"–which serves the pacing of motion–are one and the same thing, but they are not.

There is now however, a more precise use of language, and the contradiction of terms, which I described earlier may be avoided. This development is largely due–again according to Epstein–to "a new world view" that has allowed science to be "drafted in as a hand maiden." This recent involvement of science–which has been co-opted to provide increased control and techniques for studying the arts–has also produced more precise definitions of musical concepts, such as time, and motion and their demarcations. This development, and the acceptance within musical academic circles of a more performative approach to analysis, has enabled the dualistic approach taken in this study that seeks to provide a deeper, more informed interpretation of *Ondine.*

Implications

Establishing a common understanding of the terms used to describe temporal matters and the development of analytical tools that can expose aspects of the music which are not immediately apparent are of vital importance if the performer wishes to shape musical works for performance.

Keywords

time; process; rubato; shape; performative analysis

Thematic session
Perspectives on singing

WHEN WE SING TO OUR CITY! INVESTIGATING UNIVERSITY-LEVEL PSYCHOLOGICAL WELLNESS FOR CLASSICAL SINGERS IN COMMUNITY-ENGAGED PERFORMANCE

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Background

Effectively transmitting emotion and feeling through the vocal mechanism can be a daunting task. A superlative equilibrium of vulnerability and resilience are essential in order to perfect a voice and this process primarily happens within the four walls of the conservatoire–between singers and vocal instructor; students and master, and then, the nature of the audience within each singers' performance. University-level singers are often plagued by negative, self-doubting thoughts, the reasons for which are complex, though often related to difficulty in deciphering between one's self-worth apart from their voice and its abilities. Psychological states in singing students can lead to psychological and vocal freedom, or muscle tension dysphonia, depression, and other health-related issues. Discernments of success levels and intervention and root-cause analysis is needed to heighten performance outcomes.

Aims

In order to discover the root cause analysis for psychological states in the University-level voice student, research studies were devised in order to address pre-performance, performance, and post-performance influences to decipher if these competency levels can be enhanced. This research was constructed to gain insight regarding the influence of the singers' perceptions of themselves, that of their peer and their instructor within their class environment, and the audience in performance.

Method

In Study A, grounded theory and post-pre-assessment was used to explore university-level singers in the performances of arias, plus the coding open-ended interview data regarding the singers' performances of arias in class and in public. In study B, a longitudinal assessment was carried out by the students' instructor regarding their performance levels in class and in public, including gesture coded video data of the students' public performance. In Study C, a collective case study using questionnaire data was implemented to gather audience feedback regarding students' performances.

Results

In order to discover the root cause analysis for psychological effectiveness in the university-level voice student, research studies were devised in order to study the correlation between perceptions of anxiety levels at pre-performance, performance, and post-performance points to decipher if deficient competency levels can be mitigated, and in cases of well-being, replicated. In Study A, research in progress for in-class performances is revealing a correlation between performance success and deficiencies, depending on core concepts showing student anxiety, negative self-talk, and negative (as opposed to active) tension in in-class performances. Optimal performance outcomes are emerging from evidence of psychological wellness. Some singers indicate unawareness that their mental state's influence on performance outcomes. Studies B and C are currently in progress and have yet to be reported on.

Conclusions

Based on the ongoing findings from Study A and in combination with predicted results from Studies B and C, we surmise that training a voice is commensurate with training a mind and that psychogenic muscle tension dysphonia can and must be addressed within the curriculum. Teachers and students of singing benefit from on-site psychological support tools and we hope to have made a case to elicit change. It is also surmised that student performances based in community engagement are a positive influence on student singers' psychological well-being, and can enhance skill growth and performance effectiveness.

UNDERSTANDING THE PROCESS OF INFANT-DIRECTED SINGING: MATERNAL PSYCHOLOGICAL, BIOLOGICAL, AND SOCIAL RESPONSES

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Background

There has been growing research on the impact of maternal singing on infants, with data showing both reductions in behavioral anxiety and improvements in physiological measures. However, to date there has been little quantitative exploration of the impact of performing lullabies and songs on mothers. Specifically, what is it about singing that has an effect on mothers? What psychological, biological, and social processes are involved? This is an important topic given that evolutionary theories suggest that infant-directed singing is not just a recreational activity but serves specific purposes for mothers such as facilitating mother-infant bond.

Aims

This study explored three research questions surrounding the process of infant-directed singing: (RQ1) How does infant-directed singing modulate affect, anxiety, social bonding, and stress hormones in new mothers? (RQ2) Does singing have a significantly greater effect than other forms of interaction, such as chatting? (RQ3) How do psychobiological responses to singing interact?

Method

A within-subject crossover design was employed, involving 43 mothers with babies aged 3-14 months old. Exclusion criteria included smoking, taking steroidal medication, or an insufficient level of English to provide informed consent. Mothers took part in two 35-minute workshops back-to-back, providing data at the start, in between the two workshops, and at the end. The two workshops consisted of either group singing with the other mothers in the group and their babies or group chatting with the other mothers in the group and their babies. To reduce the impact of carry-over effects between the two conditions, the order in which women received the two conditions was counterbalanced. Measures included the Positive and Negative Affect Scale (PANAS), the Self-in-Other scale assessing mother-mother bond and mother-infant bond, and the Visual Analogue Anxiety Scale. Salivary cortisol and cortisone (glucocorticoids involved in stress response) and DHEA (a steroid hormone involved in immune enhancement) were also sampled.

Results

(RQ1) Singing did not have a significant impact on positive affect in the mothers. However, it did lead to decreases in negative affect ($p<0.001$), enhanced bonding between mothers ($p<0.001$), reductions in anxiety ($p<0.05$), and enhanced bonding between mother and baby ($p<0.01$), alongside reductions in cortisol and cortisone (both $p<0.001$). (RQ2) When comparing the activities directly, singing led to greater increases in positive affect ($p<0.05$) and mother-infant bonding ($p<0.05$) than chatting and greater decreases in negative affect ($p<0.05$) and cortisol ($p<0.05$), while chatting led to greater increases in mother-mother bonding ($p<0.05$). (RQ3) There is evidence of interactions between these different processes. For example, correlational analyses suggest that changes in mother-infant bonding are influenced by changes in wider affect and anxiety levels.

Conclusions

This study shows, for the first time, the effect of infant-directed singing on mothers, highlighting psychological, biological, and social processes involved in the performance of lullabies and songs. Findings are in line with previous research into the effects of singing on performers. They also shed new light on the processes by which the specific act of

singing can have longer-term effects on wellbeing and mother-infant bonding. The implications of this will be discussed.

Keywords

singing; infant; bonding; stress; cortisol

BLUE NOTES: A PILOT RANDOMIZED CONTROLLED TRIAL USING SONG WRITING TO ALLEVIATE STUDENT MENTAL HEALTH AND WELLBEING

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Background

Higher Education is a period of life transition, identified as the "exploration phase" (ages 18-24) where individuals "try out identities" through work, classes, hobbies, developing new skills, and a sense of self. Clinically, this phase is also a critical period for mental health. The National Union of Students suggest 20% of students self-identify as having feelings of mental distress, which is reflected in anecdotal experiences of academics and practitioners in health education. Unfortunately, in-house support services tend to focus on expensive short-term counselling or student-led buddy schemes, and are often operating at capacity.

Songwriting is used with a range of service users within mental health, being understood to help reduce mental distress and improve social engagement. However, it is also an accessible and popular art form, holding potential for work with non-service users beyond the clinical setting. Therapeutic songwriting operates through a mechanism of change enabling reflection and engagement with experiences. The act of group participation is also known to promote social bonding especially by promotion of fragile social ties through membership of broad social groups.

Aims

This project aims to understand whether participation in a short, weekly, songwriting program could help lower distress and improve wellbeing in 1st year students.

Method

Study design: parallel design, randomized controlled trial.

Primary outcome measures: anxiety and depression, as measured using The Hospital Anxiety and Depression Scale (HADS) at baseline and 5 weeks.

Secondary outcome measures: subjective wellbeing measured using the Satisfaction with life scale (SWLS) at baseline and 5 weeks; loneliness is measured using the UCLA Loneliness Scale at baseline and 5 weeks.

Participants

12 participants were allocated to intervention or waitlist control groups, using stratified random sampling based upon their baseline HADS scores. Inclusion criteria included: 1st year students studying at Canterbury Christ Church University, 18 years plus, self-identifying as stressed, diagnosed or self-diagnosed with mild forms of depression and/or anxiety as measured by baseline scores. Exclusion criteria included those with severe mental health problems, and/or under the treatment of NHS services.

Intervention

Students were invited to participate in a 90-minute interactive songwriting workshop, once a week for five weeks, culminating in a celebration recording session of their work. The intervention was led by an experienced music workshop leader, and structured around the approach of Baker under the guidance of a music psychologist. The control group were placed on a waiting list.

All groups were assessed using a battery of measures relating to social identity and mental health at the start and end of the study. Follow up was conducted one month after the end of the project, and the waitlist.

Conclusions

The study is currently in the intervention phase (February 2017–March 2017) trial details can be found at https://www.isrctn.com/ISRCTN11180007.

Thematic session
The musician's body

SENSORY PROCESSING AND PAIN IN CLASSICAL MUSICIANS

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Background

Performing music is a complex task that requires advanced and exceptional skills and extensive practice. Learning through experience and training is accompanied by the development of multimodal sensory and motor skills. This induces neuroplasticity changes in the central nervous system at cortical and subcortical levels. In addition, classical musicians with pain have been reported to have changes in quantitative sensory testing consistent with central sensitization pain mechanisms and maladaptive cortical reorganization. This project sought to investigate the presence of maladaptive cortical reorganization in classical musicians.

Aims

The aim of this project was to examine whether classical musicians had different working body schema, painDETECT questionnaire (PD-Q) scores and two-point discrimination (TPD) thresholds compared to non-musicians. This project also intended to examine the difference between symptomatic and asymptomatic musicians and non-musicians.

Method

Data was collected from twenty-five classical musicians and seventeen non-musicians. Motor imagery performance (MIP), TPD and PD-Q were used to assess the different groups. All participants performed the MIP task according to previously developed protocols (Moseley, 2004) using the software application Recognise (NOI, Australia). TPD was assessed using mechanical sliding caliper (Digital Vernier 300mm). PD-Q was included to screen for the presence of significant neuropathic pain component. Statistical analysis was performed using SigmaPlot12. King's College London Ethics Committee RSC BDM/14/15-55.

Results

There were no differences in accuracy or reaction time of MIP between musicians and non-musicians (p>0.05). Musicians scored significantly higher on the PD-Q compared to non-musicians (p<0.001). Symptomatic musicians also achieved significantly higher scores on the PD-Q compared to non-musicians (right arm/hand pain p=0.002; left arm/hand pain p<0.001) and also to asymptomatic musicians (p=0.007). PD-Q score was positively correlated with the "number of years playing as a professional" (r=0.05, p=0.034). Musicians had a significantly larger TPD threshold than non-musicians (p=0.035). Asymptomatic musicians demonstrated less accuracy compared to non-musicians (p=0.041), whereas no differences in TPD were found between symptomatic musicians and non-musicians (p>0.05). Symptomatic musicians had lower TPD thresholds compared to asymptomatic musicians (p<0.05). A negative correlation was found between TPD thresholds and "the number of years playing" (r=-0.52, p=0.007) and the "numbers of hours of practice" (r=-0.5, p=0.011).

Conclusions

Classical music performance and training might exert a negative effect on sensory discrimination acuity and increase in PD-Q. However, no changes were identified on MIP task. The mechanisms that underline impairment of MIP have previously been attributed to a disrupted body schema. A growing body of evidence suggests that the experience of

pain may be associated with maladaptive cortical reorganization. However, this study shows that in this population the mechanisms underlying the experience of pain may be primarily related to peripheral and subcortical mechanisms. In view of these results the presence of underlying neuropathic pain mechanisms when assessing and treating classical musicians should be considered. A greater understanding of pain mechanisms may lead to the development and application of appropriate treatment strategies for this population.

Keywords

perception; tactile-acuity; motor-imagery performance; neuropathic-pain

ANALYSIS OF MUSCLE ACTIVITY OF WIND-INSTRUMENT PLAYERS USING ELECTROMYOGRAM

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Background

Recently, there has been much research that supports the practice by visualization and feedback of human behavior in language learning and sports practice etc. However, in order to realize the support of practice, measurement techniques and analytical techniques that can accurately describe human behavior are necessary. This research is focused on the movement around the lips of wind-instrument players. Accurate visualization of the movement around the lips of wind-instrument players can not only contribute the support of practice but also contribute the wind-instrument production and dental treatment for wind-instrument players.

Aims

Our goal is the development of a measurement technique and an analytical technique which can accurately describe the movement around the lips of wind-instrument players. Electromyogram (EMG) is employed as a means to visualize the movement around the lips, and this research investigates whether features related to differences in subjects and musical instruments appear in EMG.

Method

This research employs an EMG logger which can record 8-channel electrical activities simultaneously. Electrodes are made of Ag/AgCl. The size of electrodes is 8mm in diameter. Measured facial muscles are levator labii superioris, orbicularis oris superior (OOS), orbicularis oris inferior (OOI), depressor anguli oris, zygomaticus major, and buccinator. Three trumpeters participated in the measurements. Two trumpeters are experts who have played the trumpet for 20 years and 25 years, respectively. Another trumpeter is an amateur who has played the trumpet for one half-year.

The following two measurements are carried out. Firstly, maximum voluntary contraction (MVC) is obtained using the measurement technique with visual feedback. Subjects are both required to play a musical note, e.g. F5, with maximum blowing pressure and required to create strong facial expressions that a specific facial muscle actively moves.

Secondly, subjects carry out a measurement for facial muscle activity. Subjects play three musical notes F3, F4, and F5 and the duration of each musical note is 5 seconds. Before the each playing, there are two periods for rest and for preparation. The duration of each period is 10 seconds. Two experts carry out the same measurement using a different mouthpiece.

The recorded EMG activity is converted to RMS (Root Mean Square) values. RMS values are converted to %MVC in order to compare muscle activities between different players or different trials.

Results

%MVC of OOS of three trumpeters was larger than %MVC of OOI. Moreover, %MVCs of OOS and OOI of three trumpeters were getting larger with changing to higher pitch. However, in case of experts, the difference between %MVC of OOS and OOI was also getting larger with changing to higher pitch. Although it is a result of two experts, there was no characteristic change in %MVC related to the difference in mouthpieces.

Conclusions

This research investigated whether features related to differences in subjects and musical instruments appear in EMG. There is a possibility that features related to difference in subjects appear in EMG. However, in the case of experts, the change in %MVC related to the difference in mouthpieces may be small even if it appears.

Keywords

electromyogram; wind-instrument playing; facial muscles; orbicularis oris; %MVC

ANALYSIS OF TONGUE AND BLOWING ACTIONS DURING ARTICULATION ON THE CLARINET

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Background

Referring to the characteristics of the transition between notes in a musical phrase, articulation is one of the playing skills an instrumentalist uses during expressive performance. Articulation in woodwind instruments is achieved by means of the tongue interaction with the reed, combined with the control of blowing pressure, lip force, and vocal tract configuration. The intricacies of articulation remain out of visual inspection, and thus are not straightforward to analyze. Reed bending measurements have been used to analyze the tongue-reed contact on the saxophone and the clarinet. Still, a systematic classification of the observed features is needed to find a link between articulation techniques and playing parameters used for expressive performance.

Aims

We aim at finding characteristic values for tonguing and blowing parameters during clarinetists' articulatory actions. The relationship between these parameters and the properties of the music (dynamics, tempo) are further investigated.

Method

The experiment considers a professional clarinetist from the Vienna Symphonic Orchestra who plays a melody in three articulation techniques (legato, portato or staccato), two dynamic levels (piano, forte), and two tempi (120 and 240bpm) on a German Bb clarinet. The acoustic pressures inside the musician's mouth and inside the clarinet mouthpiece are measured (Endevco 8507C-2), while the reed bending is captured with a strain gauge to obtain the reed-tip opening. Combined reed-opening and pressure measurements allow us to distinguish the tongue-reed contact (TRC) independently from the influence of the blowing actions during articulation. Once the TRC occurrences are identified in the signals, the reed-tip opening, the blowing pressure (BP), and the duration of tongue-reed contact (TRCdur) are evaluated.

Results

The results show that different combinations of tongue and blowing actions are used during performance. Portato and legato playing show constant BP throughout the musical phrase, which varies according to the dynamic level (piano: 2.5 kPa, forte: 4.5 kPa). In staccato playing, BP is reduced significantly during TRC (by 63% in slow playing and by 37% in fast playing). Moreover, the average BP is larger for staccato (piano: 3.5kPa, forte: 5.1kPa) than for portato/legato playing. TRC is only observed for portato and staccato articulation. In portato articulation, TRCdur is independent of tempo and dynamics (mean: 36ms). In staccato, TRCdur is adapted to the tempo correspondingly to the inter-onset-interval (slow: 342ms [68.4% of IOI], fast: 144ms [57.6% of IOI]). Overall, the BP depends on dynamics, tempo, and articulation technique, while the TRCdur only varies in staccato articulation.

Conclusions

Different player actions regarding clarinet articulation have been recorded and analyzed. Preliminary results show that tonguing techniques are dependent on the articulation style but are consistent at different dynamic levels. The observed tongue-reed interaction in the clarinet is in agreement with previous saxophone studies. The blowing pressure changes according to the dynamic level and depends on the articulation technique and tempo. Other features such as the influence of the vocal tract and the differences on articulation among registers, as well as an extended study with a larger set of players, are envisaged for future experiments.

Thematic session
Performance psychology

MOTIVATION, ENGAGEMENT, AND PERFORMANCE IN ELITE MUSICAL TRAINING: A LONGITUDINAL STUDY

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Background

Musicians training at the highest levels in university music schools and conservatories face considerable challenges. They need to undertake enormous amounts of practice—an activity which requires substantial effort and can be lonely, difficult, and boring. They also face considerable motivational challenges: studio teachers are renowned for their demandingness, conservatories can be hotbeds of competitiveness and pressure, and the uncertainties and risks of pursuing a music performance career require resilience and adaptability. Little systematic research has examined the motivational dynamics of music training at this level, and the style of studio instruction—a consistent tradition largely unchanged for many centuries—has rarely been scrutinized.

Aims

We aimed to understand the role motivation plays in cognitive, affective, and behavioral aspects of musicians' practice, and the subsequent effects that motivation and practice quality have on performance.

Method

Music students (N=611) from four conservatories and university music schools in three countries participated in the research. A longitudinal survey research design was used, with data collected at four time points over an academic year. Measures were taken from the established literature on motivation in educational settings or developed for the present study, based on theoretical frameworks including self-determination theory and self-regulated learning. Performance examination grades were obtained from the relevant institutions. Hypotheses were tested using structural equation modelling.

Results

Moderate to large effects were found for the role of motivation in practice quality. Students who were intrinsically motivated were more cognitively, affectively, and behaviorally engaged in their music practice, and had higher self-efficacy for their performance. The extent to which their music learning fulfilled their psychological needs impacted on important outcomes, including performance, career intentions, wellbeing, and adaptability. Controlling teaching and a poor teacher-student relationship, on the other hand, was associated with detrimental outcomes. Interestingly, the perceived competitiveness of their music learning environments was overall very low and unrelated to their motivation and practice, potentially challenging the stereotype of music schools as competitive hotbeds of pressure and anxiety. Most importantly, many of these factors were related to the quality of their music performance.

Conclusions

The results of this study provide strong evidence for the need to support student motivation and wellbeing, and also suggest ways in which music institutions and studio teachers might provide such support. The results also show that

theoretical frameworks and approaches tested extensively in other domains—self-determination theory, self-regulated learning, and deliberate practice—are also applicable to a creative performance setting at the highest levels of training.

Keywords

deliberate practice; self-determination theory; self-regulated learning; conservatory; motivation

MULTISENSORY MUSIC: TRANSFORMING MUSIC PRACTICE THROUGH CRITICAL MUSIC RESEARCH

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Background

Listening is regarded as the most fundamental way to engage with music performance, but this is challenged by a growing body of research which suggests that sight trumps sound. Music is now widely recognized as a multisensory experience, and the challenge for music education is to absorb and disseminate these recent research findings in the music curriculum. Traditional tertiary music training is focused on playing, listening, and the written score but does not adequately prepare future music professionals as critical thinkers about music production and reception. It is critical that music training equips students with knowledge and skills to capitalize on basic perceptual capacities and develop appropriate skillsets to harness current music research in their own practice.

Aims

This project answers the calls for innovative training to transform music practice through critical music research. The aim of this study is to examine music students' experiences of a novel aural perception workshop using experiential multisensory music to demonstrate the impact of current research in music practice.

Method

University music students were invited to participate in a multisensory music workshop with experienced music practitioners as their music industry mentors. The workshop translated recent research findings into an active learning activity where students participated as both listeners and performers. Participants learned about multisensory music and evaluated real world music performances to develop their capacity to use multisensory channels to their advantage in different listening contexts (where they could hear, or hear and see performers). They were challenged to consider their multisensory engagement with music performance and reflected on the way they evaluated the live performances.

Results

Results of the class discussions and performance evaluations will be discussed with reference to recent perceptual and cognitive research on the importance of visual information in music performance evaluation. The learning activity identified synergies between critical music research and music practice, where knowledge of key music findings can positively augment aural and performance literacy. Experiential workshops enabled music students to harness the intangible skills needed for evaluating performance in the music profession. Critical listening can engender independent learning in music performance and music evaluation and is directly relevant to students' careers in the music profession.

Conclusions

This project built on existing knowledge and designed a new learning opportunity for music students to actively engage them with recent research findings. It used experiential multisensory music to enhance music students' ability to critically evaluate music performance and develop a deep understanding and knowledge of the challenges of expert listening.

Keywords

performance; perception; evaluation; audiovisual; multisensory

ENACTIVE ANALYSIS OF MUSICIANS' STRATEGIES FOR DEALING WITH THE PSYCHOLOGICAL DEMANDS OF THE PREPARATION FOR AN AUDITION: TYPICAL PROFILES

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Background

Even though there is increasing evidence sustaining the role of optimal experiences during musicians' performances, as is the case of the experience of flow, most science-based intervention programs focusing on emotional experiences during performance are mainly concerned with dealing with the negative symptoms and cognitive disruptions of performance anxiety. To gain a deeper understanding of how emotional experiences unfold across the different stages of performance, context-specific and ecological methods are emerging as a potential source for better insights into what musicians feel and how they use emotions for instrumental purposes in their preparation and performance.

Aims

The purpose of this study, based on the course of action approach and theory, was to analyze the context-specific affective experiences and self-regulation efforts that music performers use during the preparation period leading up to an important performance, as well as during the performance itself.

Method

Eight professional musicians took part in this study (4 female and 4 male; aged 18 and 28, respectively). Based on an enactive and phenomenological framework, during the interviews, the subject was reverted back into the situation with the help of temporal markers. This process allowed musicians to recollect their thoughts and perceptions during the preparation of the audition, as well as the coping strategies they used to deal with the situations. The interviews were coded according to the course of action method, into elementary units of meaning (EUM).

Results

These EUMs were then grouped into sequences and macro-sequences, leading to the identification of typical patterns for how musicians deal with demanding situations while preparing for an audition. Four different profiles arose from this analysis: the task-centered musician, the musician focused on well-being, the avoidant musician, and the realistic musician.

Conclusions

The emerging profiles highlight the notion of variability in how musicians deal with stressful situations, while also suggesting that there is possibly some evidence for patterns of coping behavior. This study also shows that coping efforts are deployed distinctively throughout the different phases of the process of preparing for an audition, and that musicians adapt to each moment accordingly. Using a course of action approach is extremely pertinent because it allows for a better understanding of what musicians have lived through. Whether with a specialist or alone, musicians will be able to create new ways of approaching their auditions, improve their commitment, identify and anticipate problem situations, and thus have the mental resources to better cope with the situation.

Keywords

phenomenology; musicians; audition; coping strategies; profiles

Thematic session
Performance health and wellbeing I

THE ROLE OF LOWER TRAPEZIUS IN NECK, SHOULDER, AND UPPER-BACK PAIN IN VIOLIN, VIOLA, AND CELLO PLAYERS

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Background

Neck, shoulder, and upper-back pain is common among violin, viola (upper strings), and cello players (lower strings). However, few studies have investigated what biomechanics might be causing these injuries. Lower trapezius dysfunction has been associated with neck and shoulder/upper-back pain but the role of lower trapezius while playing a string instrument, an activity rarely reaching the last third of humeral elevation, is not clear since most studies investigating lower trapezius dysfunction have been done on "overhead" participants.

Aims

The purpose of this study was therefore to investigate the role of lower trapezius in neck, shoulder, and upper-back pain in violin/viola and cello players and to document the precise location of pain in these groups of string musicians.

Method

Eighteen violin/viola and cello players participated. They were divided into two groups, symptomatic research group (RG, n=11) and asymptomatic control group (CG, n=7). The data collection included a questionnaire, neck and shoulder examination, lower trapezius strength measurements when not playing the instrument, and surface-electromyography (EMG) measurements of lower, upper trapezius, and anterior deltoid while playing music.

Results

No difference for lower trapezius strength was found between sides within the RG or between groups. No difference was found between groups in any muscle activity while playing music. Left side symptoms were more common among violin/viola players compared to cello players.

Conclusions

The results indicate the most common location of pain to differ between upper and lower strings and other biomechanics rather than lower trapezius dysfunction to be more involved in causing neck, shoulder, and upper back pain in violin/viola and cello players.

Keywords

lower trapezius; musicians; neck; shoulder; injuries

Acknowledgments

PLAYING RELATED MUSCULOSKELETAL DISORDERS IN FLAUTISTS: RISK FACTORS AND INTERVENTIONS THAT MAY AFFECT OUTCOMES

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Background

Playing related musculoskeletal disorders (PRMDs) are common in instrumentalists. They may have a huge impact on many performers' careers, so risk factors that predispose to their development and interventions that reduce their

incidence are interesting to practitioners who treat performers. The left arm, wrist, and hand are often symptomatic in flautists. The onerous practice schedules, excessive time spent practicing, and scarcity of recovery time in a group of student flautists was observed along with how little emphasis was given to preventative activities such as warm-ups and cool-downs. This pilot study was conducted to investigate pain and injury in flautists.

Aims

To document the incidence of pain and injury in flautists, and investigate if this was related to certain variables. Further, to determine whether modifications in exercise and practice regimes could reduce pain and injury.

Method

Eighteen flautists were recruited. Initial data collection by questionnaire covered personal characteristics, painful episodes in the last 12 months, and practicing habits. A physical examination assessed areas of tenderness in the upper limbs. Participants were randomly allocated into two groups, one group participated in a practice and exercise regime and the other group made no changes. The exercises consisted of warm ups, cool downs, postural, and general fitness exercises. The questioning and physical assessment were repeated at 3 and 6 months.

Results

Demographic analysis showed that all participants had more than 10 years playing experience. Over 80% were female, aged 20-30 years old, and took regular exercise. Depressive symptoms were present in nearly 40% and anxiety symptoms in 55%. 89% had experienced at least one painful episode over the last year. The group demonstrated a high playing load, in terms of daily practice and weekly performance. Physical assessment revealed that 95% of the participants had several tender areas correlating broadly with the high incidence of painful episodes. Reassessment at 3 and 6 months showed reduction in tenderness scores in over 60% of participants, slightly more marked in the experimental group. However, this was not statistically significant. Anxiety scores were reduced in all participants at 6 months, greatest in the experimental group.

Conclusions

This study confirms the high incidence of PRMDs in flautists. It demonstrates high levels of pain in the upper limbs, many tender areas on examination and high levels of mood disturbance, particularly anxiety symptoms. It has shown that over a 6-month period both subjective complaints of pain and objective measurements of tenderness have decreased, as have anxiety symptoms, especially in the experimental group. Low statistical significance is attributed to the small sample of participants although I determined a trend that could be further explored in a bigger study. It was concluded that simply raising awareness of the importance of healthy practicing and exercise through targeted education may reduce pain and injury, and possibly also reduce anxiety.

Keywords

PRMDs; flautists; anxiety; exercise; practice

MANAGEMENT AND OUTCOME OF PLAYING-RELATED PAIN IN MUSICIANS: A LONG-TERM FOLLOW UP STUDY IN 123 PATIENTS

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Background

Playing-related pain (PRP) syndromes are the most common disorders in musicians. The current management of PRP in musicians is mainly based on clinical experience. There is a shortage of outcome studies focusing the effects of available therapies.

Aims

We performed a retrospective follow-up study to identify the long-term effects of currently available therapies and rehabilitation strategies in musicians with PRP.

Method

One hundred twenty-three musicians with PRP filled out a questionnaire and underwent a structured telephone interview. All patients were seen and diagnosed at the outpatient clinic of the Institute of Music Physiology and Musi-

cians' Medicine at Hannover University of Music, Drama, and Media. Diagnoses included chronic pain syndromes (n=106), acute overuse syndromes (n=10), and others (n=7). Patients underwent therapies and rehabilitation strategies according to principles based on the current understanding of pain processing in the human nervous system, including medication, physiotherapy, pedagogical measures, behavioral changes at the instrument and in the everyday life, body awareness and relaxation techniques, and others. Additionally, treatment according to discipline-specific guidelines was applied in selected cases.

The questionnaire and the telephone interview focused on (1) demographic data, (2b) pain intensity and self-reported playing ability at the time when pain was most intense as well as at the time of the survey, (3) treatment and rehabilitation strategies applied, and (4) patients' estimations of treatment effects of individual therapies and rehabilitation strategies.

Results

The patients' group consisted of 62 men and 61 women playing instruments of all instrument families. They started to play their instrument at a median age of 7 years (range 3-18). At the time of the survey, their median age was 30 years (range 14-73) and their median total life practice/playing time was 17,700 hours (range 2,900-111,700). At the time of the survey, the median time interval since onset of pain was 6 years (range 1-36) and the median follow-up duration since patients' first visit was 4.2 years (range 0.75-7.4).

When pain was most intense, the median self-reported pain intensity was 7 (range 2-10) on a numeric rating scale ranging from 0 to 10, where "0" means "no pain" and "10" means "worst pain imaginable." Pain intensity was significantly reduced at the time of the survey (median 1, range 0-9; $p<0.001$, Wilcoxon test). Playing ability was self-reported according to a scale ranging from 1 to 5, where "1" means "approximately 0%," "2" means "approximately 25%," "3" means "approximately 50%," "4" means "approximately 75%," and "5" means "approximately 100%" compared to the maximum playing ability before onset of symptoms. When symptoms were most severe, median self-rated playing ability was 3 (range 1-5). Playing ability was significantly improved at the time of the survey (median 5, range 2-5; $p<0.001$, Wilcoxon test).

Patients' estimations of treatment effects indicated that those measures involving an active participation of patients were rated most effective.

Conclusions

In the majority of musicians with PRP, successful treatment is possible using the currently available therapies and rehabilitation strategies. Patients' active involvement in the rehabilitation process is crucial for an optimal outcome.

Keywords

playing-related pain; overuse; musician; rehabilitation; follow-up study

Thematic session
Evaluating performance

**PIANO PROFICIENCY EVALUATION ON AUDIO-VISUAL CONDITION:
AUDIO VERSUS VISUAL / TIMING VERSUS DYNAMICS**

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Background

Recent studies have investigated the evaluation of piano performance proficiency using performance information such as MIDI-velocity and onset-time. The pianist's motion on performance, however, has not yet been considered. In an evaluation experiment for marimba performance, audio-visual stimuli of deadpan performance are more evaluated as deadpan than audio stimuli, and expressive performance is evaluated as same manner. The evaluation of musical instrumental performance is then confirmed as to be associated with the visual information, and the visual

information is also expected as to be one of the important elements in evaluating the proficiency of a piano performance. However, the importance of motion on proficiency evaluation has not yet been discussed.

Aims

This thesis focuses not only on performance sounds but also on performance motion, and aims to investigate the relationship between performance motion and proficiency evaluation.

Method

Piano performance's (*Fur Elise*) motion with audio was recorded using an optical motion capture system. Subjects were asked to evaluate experimental stimuli in terms of proficiency, expression, and technique. In addition, the effects of audio/visual/audiovisual conditions on proficiency evaluation were investigated under the following three aspects: (1) superiority of visual and audio, (2) superiority of timing and dynamics, and (3) combination effects of (1) and (2). For (1), subjects evaluated audio/visual/audiovisual stimuli. The multiple regression analysis was carried out where independent valuables are subjective scores for audio or visual stimuli and target is the subjective score of audiovisual stimuli. For (2), subjects evaluated audiovisual stimuli with altered onset-time or MIDI-velocity by using time-stretching techniques. For example, the original proficient audiovisual stimulus's audio is replaced by normal skill's performances audio, and then the proficiency evaluated. For (3), subjects evaluated audio/visual/audiovisual stimuli for different proficiency.

Results

For (1), the relative weights for the audio/visual score clarify the superiority on proficiency evaluation. The audio shows a superiority on proficiency evaluation in the ratio of 6:4 (audio:visual), whereas the visual has a superiority on technical evaluation in the ratio of 4:6. For (2), the effects of timing and dynamics on the performance on proficiency evaluation for audiovisual stimuli are almost even, under the ratio of 1:1. For (3), timing on audio is most important compared to visual timing and audio dynamics.

Conclusions

In case of proficiency evaluation for piano on audio/visual/audiovisual stimuli, the audio is more important than visual with the ratio of 6:4, and under the audiovisual condition the importance of the timing and dynamics is almost the same, which are then expected to support piano trainers' works and piano beginners' practical trainings.

Keywords

proficiency evaluation; motion capture; piano; timing; dynamics

MUSIC CRITICS ON THE ROLES AND FUNCTIONS OF MUSIC CRITICISM

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Background

Music critique is positioned between producers, artists, and their audience. One of the presumed main aims of critique is to guide consumer choices; however no research to date has confirmed this hypothesis. Furthermore, no study has offered an understanding of how critics view their own practice: the nature, role, and influence of their work.

Aims

Our aim was to document and analyze expert music critics' views on the nature and role of criticism in the modern music market with a specific focus on their work in relation to recordings of classical music. Our study examined critics' descriptions of their job role and their writing processes, plus their opinions on the impact of their writing on consumers.

Method

We ran in-depth semi-structured interviews with eight English speaking and six German speaking music critics. The critics had an average period of 32 years professional activity in major classical music review outlets in UK, Germany, and Switzerland. We have analyzed the eight English interviews using an inductive thematic analysis with a four-stage double-coder protocol. This led to a visual model that captures the role and functions of professional music

critique in the classical market as seen from the perspective of expert critics. In the next phase the emergent model was used to analyze the six German interviews. This allowed us to test the applicability of the model to a different critique sample, in a different language, and with a different musical tradition.

Results

The model that emerged from the 14 interviews distinguishes between six different role responsibilities that critics encounter as part of their job (*hats*): consumer adviser, judge, writer, teacher, stakeholder of the record market, and artist advocate. The model identifies core *principles* governing critical writing. It highlights the key *challenges* that arise from the need to juggle the responsibilities they hold towards artists, audience, and the recording industry while remaining true to their implicit code of conduct. Finally, it highlights the factors that inform critics' writing in terms of the *topics* they choose to discuss and the writing *tools* they employ.

Conclusions

The present study offers the first overview of expert music critics' understanding of their practice in the context of the music market. The emerging model self-identifies critics as mediators between producers and consumers. It also provides unique occupation-based insights into their professional standards as well as the multiple challenges they face. This body of work adds a new dimension to the music criticism literature, which is normally based only on the post hoc analysis of published critical products. Our findings offer a new interpretative viewpoint on critics' aesthetic judgments and recommendation as they arise that helps further explain the nature of their reflections and expectations regarding musical performance, and their perceived place within the musical world.

Keywords

music criticism; recording market; classical music industry; music consumption

INFLUENCES OF PERFORMANCE CRITERIA ON SELF-EVALUATION AND EXTERNAL-EVALUATION: PIANISTS' DECISIONS ON THE QUALITY OF MUSIC PERFORMANCE

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Background

Although self-evaluation itself is seen to be one of the important processes in the development of performance skill from the perspectives of self-regulation, self-evaluations of music performances can often be inconsistent and biased. However, performers' perspectives toward their own performances could be different from how others evaluate them. In a similar manner, if performers have their own criteria for self-evaluation, these criteria that are used to judge their own performance could also be used to judge the performances of others.

Aims

This research study aimed to explore the construction of performance criteria by pianists and how the criteria were applied, regarding both when they evaluate their own performances and when they evaluate the performances by other pianists. The intention was to examine what sorts of performance criteria can exist or co-exist and how these criteria might be constructed.

Method

Six professional pianists (3 men, 3 women) who were based in the UK participated (M=31.5 years old). They were asked to play individually six trials of a piece of Schumann's *Träumerei* with a grand piano in a hired hall for recordings. Within two months after recordings, each participant was asked to come to a laboratory, listen to and evaluate their own six recordings using a Triadic method. They were also required to rank all of them. Within two months after this self-evaluation session, the participants were asked to return to the laboratory and to evaluate a further six recordings as an external-evaluation session. The set of the recordings were made up of "best" selected recordings of each participant from the self-evaluation session. All data gathered, such as suggested criteria, ratings, and rankings, were subjected to hierarchal cluster analyses using SPSS.

Results

Regarding the self-evaluations, the most selected criteria included tone quality, musical expression and overall flow, which seemed to affect the judgement of the overall quality of performance, namely ranking. Even though a perfor-

mance may have received higher scores on other criteria, the criteria related to these aspects were likely to be more dominant.

As for the results from the external-evaluation, two performers evaluated their recordings to be better than other performers did; in contrast, the other two performers were likely to perceive that their recordings were inferior to others. Statistically, the criteria for self-evaluation and for external-evaluation highly overlapped for each performer (Kendall Coefficient of Concordance, w=0.75, p<0.001).

Conclusions

It was noted that even professional pianists did not always consistently evaluate their own performance as others did. In terms of the relationship between the role of self-evaluation and external evaluation in the same performer, the tendencies evidenced within self-evaluation could be found in the context of the role of external evaluator. These interactions indicated that a self-constructed tendency of evaluation could form specific and individual attitudes towards deciding the comparative quality of musical performances.

Keywords

criteria; self-evaluation; external-evaluation; piano performance

Thematic session
Performer-audience dynamics I

VISUAL AND AUDITORY CUES IN MUSIC PERFORMANCE AND THEIR ROLE IN ATTRACTING ATTENTION FROM THE AUDIENCE

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Background

Traditionally, music performances are mainly regarded as auditory events. However, recent research emphasized the importance of visual cues in the judgment of music performance. It has even been suggested that the visual component is more important than the sound production and that visual expressivity and the ability to attract attention from the audience are main skills for a successful performer.

Aims

In this study we want to investigate the respective importance of visual and auditory cues in expressive music performance and in the judgement of these performances by audience members.

Method

We designed two related experiments: In experiment 1, 10 duos of experienced musicians were invited to perform in a motion-capture studio. They were asked to perform two pieces from their repertoire. Each of the musicians needed to have a clear solo part in one of the pieces and a clearly accompanying part in the other. We asked them to perform these two pieces in two versions: one in which they acted as if it was a normal performance, and one in which they mentally switched roles: the accompanist pretending to be the soloist and vice-versa. Their movement style was analyzed based on their head and hip movements. In experiment 2, 34 participants watched video recordings of these performances while their gazing behavior was tracked by an eye-tracking system. We investigated at which of the performers of the duo they looked most frequently.

Results

The results of experiment 1 showed that musicians behaving like a soloist move more than those behaving as accompanists, and that this effect is rather exaggerated when they switch roles. Thus their 'acting' role is more significant in determining their visual behavior than their actual musical role. Experiment 2 shows that people tend to look more at musicians that move more. Here the effect is larger in the normal performance compared to the performance in

which they switched roles, which suggests that the musical content still has an influence in guiding the attention of the audience.

Conclusions

This study shows that musicians' physical behavior, and particularly the amount in which they move, is a crucial factor in attracting the attention of the audience. While current music education almost entirely focuses on improving the auditory result of the performance, these results suggest that the performer's motion behavior might deserve more attention in education.

Keywords

music performance; performance evaluation; movement; action-perception coupling; audio-visual perception

VISUALIZING PERFORMER-AUDIENCE DYNAMICS

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Background

Live performances involve complex interactions between a large number of co-present people. Performance has been defined in terms of these performer-audience dynamics, but little is known about how they work. One reason for this is the empirical challenge of capturing the behavior of performers and large audiences. Video-based approaches do not scale, and interest in audience response has led to diverse techniques of instrumentation being explored. Another reason is the difficulty of interpreting the resulting data. Discovery of phenomena as successfully practiced with video data becomes problematic when starting with numerical data sets—you cannot watch a spreadsheet, after all.

Aims

A method to facilitate inductive analyses of performer-audience dynamics is presented. Key to the approach is "experiencing" the data without losing the context of the live performance.

Main contribution

This paper presents a tool to enable the integration and interpretation of multimodal datasets. The tool updates the video paradigm to draw together diverse data streams. A computer graphic three-dimensional scene representing the live event is produced that visualizes the data in-situ. This three-dimensional representation is then registered onto video recordings, providing augmented reality views of the event. Or it can be freely navigated using a roving camera, allowing the researcher to view the event from any angle, or adopt the literal point of view of a performer or audience member.

The quality of the visualization matters. In the example presented, head pose via motion capture, facial display via computer vision, and chest expansion via medical sensor needed to be aligned. Each had their issues—wandering time base, off-axis motion capture fixtures, etc.—and only through this method could confidence in their accuracy be attained. Augmented video was essential to see the raw data in context, and notice pernicious errors in the capture. Live control over the synchronization and calibration parameters was essential to nudge the disparate sources into alignment.

In the example presented, interpretation also required interactive visualization. Having integrated the raw data sources, quantitative measures suitable for inferential statistics were required. With the visualization, the kinds of geometric tests necessary to determine who could be seen to be looking at whom could be compared, and parameters iterated until a contextually appropriate measure was judged—*seen*—working.

This method of interactive visualization links the challenges of integration of multimodal datasets, inductive discovery of phenomena, and production of qualitative and quantitative measures.

Implications

Get the performer-audience dynamics right as a street performer, and you will be financially rewarded when it comes time to pass around the hat. Get the performer-audience dynamics wrong as a storyteller, and the narrative quality of your story will suffer. The impact of performer-audience interaction in these cases was established through the use of audio-visual recordings. The method and example presented here is a step towards replicating the methodological success of such work while meeting the particular empirical challenge of live performance events.

AUDIENCE-BASED VISUALIZATION OF FREE JAZZ IMPROVISED PERFORMANCE

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Background

Freely improvised jazz performance—improvisation that does not follow any sort of script, predetermined harmonic structure, or "referent"—poses particular challenges for notation and analysis, not only because it doesn't follow a predetermined score but because performers can use their instruments in unexpected ways that don't map onto standard notation. Another challenge is that performers themselves may not characterize a particular improvisation in the same way as their performing partners or audience members who are improvisers within their community.

Aims

This investigation pilots a new way of representing a recording of free jazz improvisation that centrally features listeners' and performers' characterizations of the improvisation, discrepancies in those characterizations, and which characterizations are endorsed by which listeners. The time-based representation includes the audio recording itself, a visualization of the waveform that makes it straightforward to navigate the recording, performers' and listeners' verbal characterizations of particular moments in the performance, and listeners' aggregate levels of agreement with particular characterizations. It also makes available the extent to which the perspectives of different kinds of listeners—in this case listeners who improvise on different instruments within the New York City and Berlin scenes—align.

Method

The representation is based upon the two recorded excerpts from a free jazz improvised duo performance by a New York-based pianist and saxophonist of international renown, along with 302 post-performance characterizations of these recordings collected from a previous study. The characterizations were elicited in individual interviews immediately after the performance with the two performers as well as two commenting listeners from the same performance community (a saxophonist and a drummer), and anonymized so that one couldn't tell who had produced them. Because the interviews involved attentive listening to the recording, many of the characterizations focus on particular moments in these performances that are highly specific.

The representation includes the ratings by these four participants of the extent to which they agreed with these 302 characterizations—those they themselves had produced and those produced by the others. It also includes ratings of agreement with these 302 statements by 17 new listeners who are themselves improvisers in the free jazz performance communities in New York City and Berlin. These ratings were collected in an online survey, using the materials from the previous case study.

Results

The representation created here provides a new way of seeing the findings from the previous case study, as well as newly collected ratings by additional members of two different free jazz performance communities. It also allows representation of the extent to which the previous case study findings generalize beyond the four participants in that study: these participants agreed with each other less on statements about performers' intentions and actions than on characterizations of the music product.

Conclusions

This visualization is a first step towards creating a flexible tool that allows audience-centered analysis of performance in multiple genres and with multiple kinds of audience members.

Thematic session
Performance health and wellbeing II

INVESTIGATING AWARENESS AND INCIDENCE OF ACID REFLUX AMONG UK CONSERVATOIRE STUDENT SINGERS

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Background

There is mounting evidence that a relatively high incidence of acid reflux occurs among conservatoire singers, compared with other musicians. Since the tissues of the larynx and oesophagus are not equipped to deal with stomach acids and enzymes the resulting damage can cause ongoing problems, which manifest as serious vocal, and other long term health issues. Based on the literature, we hypothesized that performer lifestyle and possibly technical strategies and practice may be contributory factors.

Aims

We examined student awareness of the symptoms and possible long-term effects of severe and/or chronic reflux and sought to identify possible indicators of susceptibility.

Method

A pilot study was undertaken to test the incidence of reflux among the student population. An online questionnaire based on a simplified version of the Reflux Symptom Index was sent to a random sample of students at Trinity Laban Conservatoire. Of 114 respondents (45 male, 69 female) ten had a score of >13 on the RSI, considered abnormal and indicative of reflux. Four abnormal scores were from singers which was 15% of the total number of singers who took part (n=27). Data suggested that singers are more likely to suffer the symptoms of Acid Reflux than other student musicians. Following these findings, we investigated singing students' awareness of reflux and possible singing or lifestyle causes. Within a semi-structured interview format, a qualitative, inductive approach allowed collection and analysis of data that reflected maximal sharing of individual experiences. Participants were five first-study singing students recruited from Trinity Laban Conservatoire. In addition to demographic information, questions explored participants' understanding and experiences of reflux, what specific breathing strategies they currently use, and their perceptions of their own anxiety levels. Open-ended questions, together with probes and prompts, allowed minimum restriction of response. All participants were given information sheets and consent forms and were assured of full confidentiality and the opportunity to withdraw from the study at any time.

Results

Data revealed that both lifestyle choices and breath management strategies appear to be contributory factors in causing higher than average levels of reflux. All participants recognized the significance of diet as a causative factor and the two with highest reflux reported suffering from stress and anxiety. All knew that reflux is a significant issue for singers, but none understood the full implications of the symptoms and how these might affect the singing voice. The two with the lowest scores reported breathing strategies based in the lower part of the abdominal wall and even the pelvic floor, whereas the participant with the highest score based breathing strategies on the upper part of the chest (around the ribs).

Conclusions

There is a general lack of awareness of the significance of symptoms of reflux, including correlations between stress and reflux and breath management strategies and reflux. Reflux appears to be exacerbated by stress and poor lifestyle choices. Anxiety also may encourage upper chest breathing, whereas lower abdominal breathing appears to

mitigate against symptoms of reflux. Although trends have been identified, larger and more detailed study would be needed in order to translate these findings into recommendations for training.

Keywords

singing; reflux; breathing; anxiety; technique

THE IMPACT OF FOOTWEAR, FLEXIBILITY, AND AGE ON INJURIES ACROSS DIFFERENT STYLES OF DANCE

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Background

Professional dancers have similar physiological workloads to professional athletes with some studies showing injury rates in dancers of up to 80% per year, yet research into risk, cause, and prevention of dance injuries is limited, especially regarding age, dance style, footwear, and flexibility. This study investigated the impact of these factors on dance injury with the aim of informing clinical practitioners when treating dancers and of alerting dance professionals with regard to injury prevention.

Aims

To investigate relationships between dance style, footwear, and injury rate in female dancers, considering age and flexibility.

Method

A questionnaire was created and distributed to dancers using social media in the UK, USA, and Germany. We received 103 responses. Questions included dance experience and practice patterns, information on training, and performance footwear, injury history, recovery time, and signs of flexibility. The responses were analyzed and a Global Injury Score combining number and severity of injuries was created in order to compare outcomes.

Results

Of the 103 questionnaire respondents, 77% had sustained an injury of varying severity in the previous year with 47% of respondents sustaining more than 2 injuries, and 24% more than 4 injuries in a year. Of the 77% of dancers reporting injury, 76.23% confirmed signs of hypermobility. Out of the injured dancers 33.77% did not seek treatment from a medical professional. Our results also showed that dancing in heeled and pointe shoes increases injury risk compared with dancing with flat or no shoes, that injury rate and recovery time increased with age above 30 years old (p=0.01), and that hypermobility had the greatest correlation with injury rate.

Conclusions

This study supports current injury epidemiological studies in dancers, which highlight the discrepancies in injury rates between dance and sport. Age, style of dance, and footwear all impact injury rate, with dancing in flat shoes or barefoot correlating with reduced injury rate. Furthermore, it was found that hypermobility has the greatest influence on injury, regardless of dance style. Knowledge of these factors should inform clinical practice in the treatment of the injured dancer, and assist teachers and coaches in implementing safe dance practice.

Keywords

dance injury; footwear; hypermobility; age; female

Thematic session
Performance factors II

PERSONALITY AND PERFORMER: DEFINING A SATISFYING COLLABORATIVE RELATIONSHIP

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Background

Life experiences and musical experiences sometimes align to allow performers to find the most exquisite and satisfying collaborations. All musicians have choices that will define their experiences: choices based on their own personalities and motivations, and choices about which collaborators they want to work with artistically. There are times that musicians do not have these choices, but they do have information. This paper discusses the issues faced by singers and pianists in collaborative partnerships, and the personality considerations that may positively or negatively affect the musical relationship and, ultimately, the musical performance.

Presenters will define a healthy collaborative partnership, based on the research done by Peretz and Zatorre on cognitive neuroscience; Juslin and Sloboda on emotion; and Parncutt and McPherson, Williamon, and Davidson on performance.

Aims

It is the aim of this paper to empower every musical collaborator with information to continue to make intelligent and informed choices when choosing collaborative partners. Through the use of the personality factors espoused by the Meyers-Briggs personality profile, the researchers will identify traits that predict the most satisfying partnerships. Specific questions addressed include: What are the characteristics of the best collaborative relationships? How may those characteristics be defined in order to identify the most compatible collaborative partners, as well as to maximize the collaborative experience with partners of all personality types?

Additional issues of vulnerability in rehearsal and performance, intrinsic motivation, self-efficacy, expectancy, and extrinsic value will be addressed.

Method

Researchers collected anonymous survey data from singers and pianists around the United States about their most satisfying collaborative partnerships. Survey questions addressed personality preferences in the respondent, and the respondent's perception of their most collaborative relationship. Survey participants were selected from professional and academic settings, either by personal recommendation or professional reputation.

Data were collected in a multiple-choice format via email survey in conjunction with demographic data about education level, years of collaborative experience, and primary profession.

Results

The presenters will report on the results from a survey of singers and pianists about the most satisfying collaborative partnerships they have encountered, focusing primarily on Meyers-Briggs personality criteria. Comparisons will also be made between years of collaborative experience and education/training levels. With this information, collaborators will be equipped with tools to navigate the challenges present in musical partnerships.

These results will be illustrated through, and compared to, the presenters' own experiences from recent collaborative recital preparation and performance.

Conclusions

While not every collaborative partnership allows for discrete selection, artists can learn from those partnerships that are most satisfying by identifying the personality elements that define a potentially satisfying collaborator. This research will enable and empower potential collaborators to identify early in the musical process those partners who will potentially be the "best fit" for their own personality types, leading to a more satisfying musical rehearsal and performance experience.

Keywords

collaborate; recital; partnership; singer; pianist

THE ROLE OF REPETITION IN PIANO PRACTICE AT VARIED LEVELS OF EXPERTISE

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Background

The practice of piano students from different academic levels and that of professional pianists has been described in terms of several behavioral modes, namely playing sequences without interruption, modeling after real and/or imagined performances, and use of varied rhythmic patterns, just to mention a few of the preferred modes of practicing. These strategies are seen as inherent to the process of improving performance levels. As a procedure, repetition seems to fit the needs of a significant number of pianists, be they students and/or professionals.

Aims

The present research aimed at investigating the nature of and the role of repetition as a strategy in piano practice of pianists at different academic levels and professional rankings.

Method

A group of 16 piano students and 2 professionals audio-video recorded one practice session of two piano pieces of their choice currently being learned. The participants were also interviewed in order to get information on procedures employed during practice including their choice of segmentations in relations to their current understanding of the works. The recorded sections were analyzed in terms of procedures categorized according to the local focus of attention. The frequency of fragments/sections with literal repetitions and variations were tallied. Additionally, the number of errors (considered as mishaps) was also taken into account. For the present communication, four cases were analyzed: P3 (a pre-college student), P9 (an undergraduate student), P13 (a doctoral student), and P17 (a professional pianist).

Results

For P3, the number of repetitions with minimal variations is higher than varied repeats. Also, segments seem to be randomly chosen at this stage of development. The relationship between the relative use of varied repetition and the probability of errors is described by a reverse bell curve (a small/large number of varied repetitions seems to impinge a higher frequency of errors). Strategies that combine repetitions with together/separate hands, with/without pedal, and tempo variations were shown to be inherent to the level of expertise. Furthermore, as the expertise level increases, the range and efficacy of strategies improves to include variations in rhythm and articulation. At the level of expertise pianists seemed to aim at highlighting the fluency and clarity of previously deliberated results. Nevertheless, one cannot neglect the role of manipulating expressive factors, isolating of structural elements that seem to regulate the focus of attention during practice.

Conclusions

At the lower levels of expertise (P3 and P9) unvarying repetition is a randomly used device. As the level of expertise increases (P13 and P17) there is an increase in sophistication including repeats with diverse rhythmic patterns, temporal manipulations, and the employment of consistent strategies as to also suggest greater focus of attention during practice sections.

Keywords

piano practice; repetition; level of expertise; focus of attention

Acknowledgments

Thematic session
Performance signals

DEVELOPING FAMILIARITY: REHEARSAL TALK IN A NEW DUO

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Background

One way of exploring the social and cognitive processes underlying collaborative rehearsal is to study "rehearsal talk." This can be an invaluable tool for learning about the development of familiarity between members of chamber music ensembles and duos who have not worked together before. It is also useful for learning about how musicians develop familiarity with the music they are preparing for performance, particularly if it is new to them; they will each have their own initial conceptualizations of the work, but by the time they perform it in public they will have to have negotiated a shared understanding and be able to convey it unanimously and with conviction. Previous studies of rehearsal talk have been undertaken with well-established duos and of single rehearsals carried out by new duos; the present study involved the analysis of talk in six daily rehearsals by two people who did not know each other well, and had not worked together previously, preparing to perform a work new to both of them, from memory, before a small audience.

Aims

The study aimed to identify the characteristics of the developing social relationship between the musicians and the features of the music to which they referred in their talk during rehearsals.

Method

The participant-researchers in the study were both experienced musicians: a soprano and viola player. They were preparing to perform two songs dating from 1925-1926: poems by Rudyard Kipling translated (loosely) into Russian and set to music by Boris Tchaikovsky. The musicians undertook daily individual practice sessions and joint rehearsals for six days before performing them to a small audience. The first song ("Amazon") was played from memory by the viola player while the soprano used the score; the second song ("Homer") was sung from memory by the soprano while the viola player used the score. All practice sessions and rehearsals were audio-recorded and transcribed.

Results

A content analysis of the transcriptions of the rehearsals is to be reported. Two discrete coding schemes, both of which have been used in previous research, are applied to each spoken utterance, with reference to the musical material sung and played. Styles of interaction, and therefore the developing characteristics of the social-emotional relationship between the musicians over time, are identified using Interactive Process Analysis. Rehearsal strategies and musical dimensions, the latter reflecting the features of the music to which the musicians attended during rehearsal and of which some ultimately became performance cues, are identified using an adaptation and extension of Chaffin, Imreh, and Crawford's coding framework.

Conclusions

The results will be discussed in relation to those of the previous study by Ginsborg and Bennett, and reported at ISPS 2017, exploring the development of performance cues in the same series of rehearsals, and previous studies of rehearsal talk in established and new duos.

Keywords

memory; rehearsal; songs; viola; voice

MAPPING VISUAL ATTENTION OF DUO MUSICIANS DURING REHEARSAL OF TEMPORALLY-AMBIGUOUS MUSIC

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Background

Small ensembles in the Western classical tradition can usually coordinate their playing without exchanging visual cues. Shared interpretative intentions (partly the result of familiarity with the musical genre and partly the result of rehearsal) and access to each other's sound are mostly sufficient for successful coordination, even if visual contact is not possible. However, in situations where performers' interpretations of the music are less likely to converge (e.g. at piece entries; following abrupt tempo changes; in periods of free meter), visual communication may help with aligning intentions and coordinating output. In such cases, we hypothesize that visual communication serves two functions for ensemble performers: (1) it facilitates coordination by clarifying the performers' intended timing and (2) it enables confirmation of joint attention and understanding.

Aims

This study mapped the course of duo musicians' body gestures and visual attention as they coordinated performances of an unfamiliar, temporally unpredictable piece of music. The aim was to determine under what conditions musicians look at each other (e.g. when certainty of the co-performer's intentions is low), where they focus (e.g. on the face, body, or instrument), and whether coordination improves when visual communication is possible.

Method

Motion capture, eye gaze, and audio recordings were collected as piano and clarinet duos performed several renditions of an unfamiliar piece. The piece had been specially written for the study and included passages in free meter, alternations between specified meters, and periods of contrasting accent patterns in primo and secondo parts. The piece was structured so that it would be challenging for a skilled duo to coordinate (though primo and secondo parts were not very difficult to play individually). The experiment session was conducted like a structured rehearsal: three complete performances were recorded in which two-way visual contact between musicians was possible, including one at the very start of the session, one midway through a period of free practice, and one at the end. A fourth complete performance was then recorded as well, in which musicians were unable to see each other.

Results

Data collection is ongoing, but analysis of eye gaze patterns should show that performers spend more time looking towards each other during periods of high unpredictability, and less time looking towards each other during periods of high predictability. As such, performers should make less use of visual signalling as their familiarity with the music increases. Performers are also expected to look more towards their partner's face than towards any other part of their partner's body or instrument.

Conclusions

Our results should show some parallels to the patterns of visual attention previously observed in the context of linguistic communication, such as increased eye contact during turn-exchanging. A focus on the co-performer's face rather than peripheral body movements—as occurs during communication via sign language—would suggest that monitoring others' attention may aid coordination in unpredictable contexts. Decreased time spent looking towards each other across successive performances will show that reliance on visual signalling declines as performers settle on a shared interpretation and become more certain of each other's intentions.

Keywords

ensemble performance; visual attention; body movement; coordination; visual communication

Acknowledgments

Saturday
02 September 2017

Symposium
The science of performance careers:
A lifespan view of employability in music

THE SCIENCE OF PERFORMANCE CAREERS: THE RATIONALE FOR A LIFESPAN VIEW OF EMPLOYABILITY IN MUSIC

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Background

Careers in music feature a non-linear career trajectory and they are likely to encompass self-managed, concurrent, and overlapping roles. For performers, this often necessitates the management of full or part-time, and casual roles with little access to health care, paid leave, or retirement provisions. Moreover, recent research suggests that the careers of performers remain precarious throughout the career lifespan, with older performers gaining work through reputation but losing work as their physical acuity diminishes. Research also suggests an increase in the rates of harassment and the abuse of workers' rights among workers such as musicians in professions where the competition for work is fierce and the work unstable.

Aims

The aim of this introductory paper is to introduce each of the seminar themes in relation to performers across the career lifespan. As such, the presentation will touch upon psychological and physical health and wellbeing, the older worker, and pedagogical approaches for career preparation and support.

Main contribution

This presentation will outline a proposal for multi-disciplinary research to understand the science of performance careers. The presentation will draw together the extant research together with industry and governmental reports as an introduction to the papers and as a provocation for listeners to contribute to the broader discussion to follow.

Keywords

performer; musician; career; lifespan; employability

HEALTHY PERFORMERS AND SUSTAINABLE CAREERS: THE ROLE OF INDIVIDUAL ATTITUDES, BEHAVIORS, AND PERCEPTIONS

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Background

The music career is characterized by constant scrutiny and pressure to excel, competition, instability, and antisocial work hours, which can influence musicians' ability to keep the high standards and sustain a successful and healthy career. Consequently, musicians are required to develop a diverse set of skills (e.g. technical, psychological, physical, and social) in order to achieve and sustain a successful career. Sadly, research has shown that making music often leads to performance-related musculoskeletal, psychological, and emotional problems, which can be detrimental to performers' careers. While the demands of the profession are well known, how performers' lifestyles, health-promoting attitudes, and behaviors impact on their health and wellbeing, and consequently the sustainability of their careers, remains to be examined.

Aims

The aims of this presentation are (1) to examine new evidence on professional musicians' health and wellbeing profiles and (2) to discuss implications for success and sustainability in music careers.

Method

Two hundred and twenty-nine professional musicians completed a comprehensive survey that included measures of wellbeing, health-promoting behaviors, perfectionism, coping skills, sleep quality, fatigue, and perceived general health. Of the 229 participants, 60% (N=137) were considered for analysis. Mean age was 42 years (SD=13), 63% women. Instrument groups represented were: strings (64%), keyboard (1%), woodwind (22%), brass (12%), and percussion (1%). 66% of participants were employed, 34% freelance. Descriptive and comparative analyses were used to explore sex and professional status differences.

Results

Wellbeing levels were similar to the UK population. Overall, there were limited to sufficient levels of engagement in health-promoting behaviors. Nutrition, spiritual growth, and interpersonal relationships were the highest scores but health responsibility was the lowest. Results also pointed to a risk of maladaptive perfectionism, and showed poor sleep quality and perceived health. However, fatigue levels were within normative standards. Differences were observed between women and men as well as employed and freelance musicians on health-promoting behaviors, with better scores reported for women (nutrition, health responsibility) and freelance musicians (spiritual growth and nutrition).

Conclusions

Research on musicians' health and wellbeing has mostly focused on the detrimental impact of making music to the performer and the performance. Little is known, however, about the performers' attitudes, perceptions, and behaviors that may determine their health and wellbeing, and consequently, the success and sustainability of their careers. This study sheds new light on the normative behaviors and attitudes of musicians and, by doing so, it brings a new approach to investigate the challenges of pursuing a career in music. Two main questions emerged from this study: (1) how can musicians engage more effectively with healthy lifestyles in order to more effectively deal with the demands of the profession and (2) what is the role of individuals, institutions, and the sector in developing healthier performing careers. Achieving a successful and sustainable career is increasingly seen as the responsibility of the individual, but education and training have hardly addressed the transversal psychological, life, and career skills required to face the demands of a music career, which may impact the next generation of performers.

Keywords

orchestral musician; lifestyle; wellbeing; health; coping

Acknowledgments

IS THERE A CAREER TRAJECTORY IN MUSIC?
MUSIC CAREERS THROUGH A LIFE-SPAN PERSPECTIVE

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Background

Most research about how musicians navigate their careers looks at their careers at one single point in time. However, in order to fully grasp the dynamic nature of how musicians' work and careers unfold, a life-span perspective is needed.

Aims

This presentation provides a life-span perspective in how musicians cycle through multiple career stages.

Method

The researchers employed lifespan perspective theory in the form of selection, optimization, and compensation (SOC) theory, to understand practice in early, mid-, and late-career through the use of retrospectively longitudinal questions and storytelling. One hundred and eight musicians both from the Netherlands and Australia participated in the study.

Results

Lifespan perspective theory highlighted the complexities of musicians' work across the career lifespan. The study revealed early career musicians to be focused on goals and outcomes that they hoped would align available resources and resource demands. Performance goals dominated these narratives, and yet even in early career, musicians began to optimize their potential by rethinking career success in terms other than performance. In the mid-career phase, musicians reported that their initial performance focus and lack of career awareness had not enabled them to maximize their potential. They frequently emphasized declining income, and they compensated by leaving music or by adopting multiple roles and new skills within and beyond music. By late career, musicians employed selection strategies that enabled the application of their broad skills and experience to roles within and outside music. These roles, often entrepreneurial and featuring self-employment, were most often the result of an enforced transition.

Conclusions

This study sheds light on the way musicians navigate their careers as they move from early to mid- and finally late-career. First of all, the finding that the impact of insufficient career awareness and skills development was felt across the career lifespan confirms the need to better prepare music students for their careers. Moreover, the employment challenges expressed by mid- and late-career musicians underscore the precarious nature of creative industries work, which is characterized by the persistence of precarious work across the career lifespan, often forcing older musicians into self-employment.

Keywords

career stage; SOC theory; musicians

Thematic session
Insights from dance

INTRA-INDIVIDUAL AND INTER-INDIVIDUAL VARIABILITY OF UPPER LIMB MOVEMENTS OF BALLET DANCERS IN SWAN LAKE ACT 2

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Background

In dance, movement characteristics may differ by dancers even when their roles are the same. Sakata and colleagues reported that the movement characteristics of Japanese traditional dance were different depending on the roles, despite their identical dance method. From this study, it is considered that the individual movement characteristics will be related to the expressiveness or proficiency of dancers. However, there are no studies that have examined individual differences of movement characteristics by ballet dancers.

Aims

The purpose of this study was to examine both intra- and inter-individual differences in upper limb movements when ballet dancers perform the flaps of swan wing movements.

Method

Three professional female ballet dancers (PRO), six advanced female ballet dancers (ADV), 14 intermediate female ballet dancers (INT), and 21 age-matched females without any previous dance experiences (CON) participated in this

study. Thirty-three reflective markers were attached to the trunk and upper limbs, and then the motion of the upper limb usually performed by dancers in Act 2 of *Swan Lake* was captured with 8 optical cameras. Each subject performed a total of 12 trials with the sound of the metronome. The upper limb joint angles (shoulder joint; elbow joint; wrist joint) were calculated from the coordinates of the markers. The intra-individual and inter-individual variability of upper limb joint angles were compared between groups by rmsCV which was an index of variability.

Results

In PRO, ADV, and INT groups, the intra-individual variability in the horizontal flexion/extension of the shoulder joint and the palmar/dorsal flexion of the wrist joint was significantly smaller than those of the CON group. While the external/internal rotation of the shoulder joint, the flexion/extension of the elbow joint, the supination/pronation of the forearm, and radial/ulnar flexion of the wrist joint were significantly greater than those of CON group. In the inter-individual variability, PRO, ADV, and INT groups increased rmsCV significantly in the horizontal flexion/extension and the external/internal rotation of the shoulder joint, the supination/pronation of the forearm and the radial/ulnar flexion of the wrist joint in the former half of the upward movement and the latter half of the downward movement, the flexion/extension of the elbow joint in the middle section of the upward movement, and the palmar/dorsal flexion of the wrist joint in the former half of the upward and downward movement. Furthermore, in these joint movements, the inter-individual variability of PRO group was significantly greater than those of ADV and INT groups.

Conclusions

In this study, the intra-individual and inter-individual variability of upper limb joint movements was examined by comparing the different levels of skilled dancers. As the result, the individual difference in each joint movement varied widely by individuals in ballet dancers, especially in professional dancers.

Keywords

intra-individual variability; inter-individual variability; ballet dancers; joint movement; skill levels

Acknowledgments

BRINGING A NEW PERSPECTIVE TO VOCATIONAL DANCE TRAINING: QUALITY RATHER THAN QUANTITY SHOULD BE THE BATTLE CRY

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Background

Elite dance and sport attract highly motivated, perfectionistic individuals to environments that are highly competitive and physically demanding. While philosophical debate may continue regarding the artistic side of dance that may not be present in sport, in the context of physical activity and resultant impact on health, dance should be considered an equal and afforded the same attention to its effect on the body as seen in sporting disciplines. How these bodies are trained to fulfill the different performance goals differ enormously, though there are some similarities with long hours of training from an early age, tradition, and the coach/teacher guru playing fundamental roles. On the whole the basic training environment for the disciplines have very different emphasis, with dance the focus is technique enhancement whilst for sport, development of the sport-specific physical attributes of the participants.

Aims

Training pre-professional dancers has become increasingly complex due to the diverse skill demands being placed on today's graduate. This has often led to an overloaded curriculum resulting in a heavy workload for teachers and students alike, causing increased perceptions of fatigue, overwork, and increased prevalence of injuries. The presentation will demonstrate how a vocational school curriculum was adapted utilizing periodization principles. It incorporated macro- and micro-cycles across a 4-year programme that saw the development of yearly progressional goals.

Main contribution

The solution is a focus on "quality" rather than "quantity" within training; this is achieved by programming rest and/or reduced training load days into the weekly schedule and by monitoring the overall daily, weekly, and monthly training loads. As dance is a high skill activity, fatigue has an enormous detrimental effect on skill acquisition and neither the dancer nor teacher will get the optimum learning experience in the latter classes of a day. Therefore, the intensities of the classes are varied throughout the day, with high and low workloads, to allow the dancer to rest and recover so that in the last class of the day the dancer is in a state to learn without being overly fatigued. Workload isn't there to stifle artistry but to enhance the dancer's overall global skill acquisition in multiple genres. Fundamental to the whole process is communication between the whole team so that they understand the goals of that term or season, how these are to be achieved on a weekly basis and the role they will play in it.

Implications

The implemented changes have seen recognition of these changes with the awarding of an international distinction for higher education, 95% of graduates working as either a dancer or choreographer, and a decrease in injury incidence and course drop-out. The talk will provide details of the theoretical frame that was utilized within the development of the programme as well as discussing the implications from an artistic, practical, and educational perspective, including staff experiences.

Keywords

periodization; vocational dance training; workload; performance enhancement; injury reduction

CHOREOGRAPHY AS EMBODIED PERFORMANCE

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Background

This paper examines dance choreography as embodied performance. Choreographic methods and practices are explored and framed from a social and cultural perspective using Pierre Bourdieu's critique of the perpetuating social order. The "logic of practice," "structuring structures" capital, "rules of the game" *habitus*, embodied narratives, and identities are considered from the perspective of the choreographer, the dancers, and a musician during creation and performances of a dance choreography entitled *Sonnet*. This work is part of a larger on-going ethnographic study of the social world of choreography and choreographers.

Aims

(1) To create a piece of dance choreography/performance using classical theme, form and vocabulary, gesture, iambic pentameter (inspired by Shakespeare), and a clear narrative structure. (2) To articulate through choreography a critic of traditional roles, relationships, and gender expectations, using Bourdieu's theoretical frame: the perpetuating social order, "structuring structures," "rules of the game" habitus, and capital. (3) To critically investigate choreographic methods and processes, embodied narratives, and identities from the perspectives of the choreographer, dancers, and the musician. (4) To examine choreography as embodied performance.

Method

The work is practice-based research using an ethnographic approach. Classical theme, form, and dance vocabulary, gesture, iambic pentameter, and a clear narrative structure are used in the development of the choreography. Documentation includes the use of qualitative methods: journal entries as reflexivity and critical reflections/questions from the choreographer, dancers, and musician, critical work-in-process sessions using Liz Lerman's Critical Response Framework, audiences' responses to performances, and filming of processes of making.

Results

Sonnet is a dance duet inspired by the Bard's great poetic work on his 400th anniversary. The piece is performed to live saxophone and applies the structure of the iambic pentameter, predominantly used by Shakespeare in his Sonnets, as a form of meter that informs the phrasing of movement for the dancers. The work at first appears to offer traditional roles and relationships, as very typical and classical in form, but that which the dancers portray is intended to be opposite. As a critic of traditional roles in relationships, the perpetuating social order and "rules of the game," the choreography illustrates complexities in *habitus*, with the male and female duo dancing altering views on

gender expectations. Throughout the piece, classical style and movement vocabulary are seen but with the male gentle and withdrawn at times, whilst the female is evidently the more powerful—confident and sometimes comforting. *Sonnet* is intended to portray beauty, love, pain, and loss in its lyrical quality. The process and performances were lived, constructed, embodied, and narrated by the choreographer, dancers, and musician. The choreographer's and performers' *habitus*, capital, and identities are produced through dominant beliefs about the body and roles that are powerfully conveyed through the repetitive structures of society. The use of reflexive and reflective methods enabled critical engagement in the process of making and in understanding choreography as embodied performance.

Conclusions

Bourdieu's theoretical contribution to this study and the use of an ethnographic approach to the practice-based research, offers significant ways of understanding the processes via which performance and performer identities are constructed. Findings reveal significant relationships between the performer and the social worlds of dance, music, and choreography as embodied performance.

Keywords

choreography; embodied performance; identity; Bourdieu; reflexivity

Thematic session
Musical development

CHILDHOOD ADVERSITY AND THE CREATIVE EXPERIENCE IN PROFESSIONAL PERFORMING ARTISTS

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Background

Paula Thomson and S. Victoria Jaque are Professors in the Department of Kinesiology, California State University, Northridge. Dr. Thomson is a choreographer (opera, theatre, dance) and clinical psychologist. Dr. Jaque is an exercise physiologist. Together they are currently investigating psychophysiological stress responses in performing artists, athletes, and functional disordered patients.

Aims

The aim of this study was to examine differences in creative experiences, optimal performance, and psychopathology among professional performing artists who experienced no childhood adversity, some adversity, or substantial adversity. Childhood adversity is identified as any exposure to abuse (emotional, physical, sexual), neglect (emotional, physical), or family dysfunction (parental separation/divorce, family member with mental illness, and/or substance abuse, domestic violence, family member imprisoned). Greater exposure to childhood adversity has been strongly identified with increased morbidity and mortality. By determining the relationship of past childhood adversity, creative experiences, optimal performance, and psychological difficulties, training practices can be targeted to enhance creative processing and performance. We hypothesized that more childhood adversity would be related to increased psychological difficulties, and decreased positive creative and performance experiences.

Method

This cross-section IRB approved study examined 234 professional performers (dancers, opera singers, actors, directors, musicians). Self-report measurements were included to examine the following psychological factors: adverse childhood experiences (ACE questionnaire), experience of creativity questionnaire (ECQ), dispositional flow (Dispositional Flow Scale; DFS2), trait anxiety (State-trait Anxiety Inventory; STAI-T), internalized shame (ISS), fantasy (Inventory of Childhood Memories and Imaginings; ICMI), and total adult and childhood traumatic events (Traumatic Events Questionnaire; TEQ). The sample was divided into three groups based on ACE scores (0 ACE (n=93), 1–3 ACEs (n=95), ≥4 ACEs (n=42). SPSS-24 was used to calculate descriptive statistics and multivariate analyses of covariance (MANCOVA), with age and gender included as covariates (Bonferroni alpha [0.05] corrections were used to determine the nature of the differences between the group means).

Results

The MANCOVA results revealed no significant (p=0.28) differences between all three ACE groups for the nine flow scales (optimal performance measurements). Performing artists with ≥4 ACEs had significantly stronger creative experiences (p=0.006) related to distinct creative processing, absorption, and a transformational sense of self and the world. They were also more fantasy prone, shame-based, anxious, and experienced more cumulative past traumatic events (p<0.001).

Conclusions

Despite solid research findings that demonstrate profound long term deleterious psychological and physical effects of ≥4 ACEs, in this sample of professional performing artists, this high ACE group had stronger creative experiences and they were equally able to achieve optimal performances. However, they also experienced more anxiety, internalized shame, and cumulative past traumatic events. These findings partial supported the study hypothesis. Although the high ACE group experienced greater negative effects, they also endorsed positive creative performance experiences. Perhaps engaging as a performing artist, along with higher fantasy proneness, served to buffer the effects of a higher incidence of childhood adversity.

Keywords

adversity; anxiety; creativity; flow; shame

THE MAGIC HAT: ON THE EFFECT OF PLAYFUL METHODS ON THE MEASURING OF 3-YEAR-OLD CHILDREN'S SINGING PROFICIENCY

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Background

The present study used an innovative research protocol in order to evaluate the singing ability of 3-year-old children. Playful methods were applied for the purpose of helping toddlers to perform according to their highest ability. Previous research suggests that 3-year-old children are not very capable singers. However, the conventional methods used for testing singing ability may not be favorable for young toddlers.

Aims

A recent project developed a protocol called "The magic hat" in order to improve the quality singing responses with 3-year-olds. This procedure was implemented with 39 Icelandic 3-year-olds in one-on-one sessions in a quiet room at the children's preschool.

Main contribution

The response rate of the 3-year-olds was 89.7%, which is high for this age group, confirming the appropriateness of the protocol applied. The singing ability of the 3-year-olds in this study was estimated as higher than the average ability of 5-year-olds in numerous international studies using conventional testing procedures. Significant differences were found in children's performances of a standard song compared to a song of their own choosing. The implications of various protocols for measuring and evaluating children's singing ability will be discussed.

Implications

The results suggest that it is possible to obtain reliable singing data from a sample of 3-year-old children if age appropriate methods are applied. Findings furthermore indicate that singing ability in toddlers may be gravely underestimated in the music psychology literature to date, which has implications for the current knowledge portrayed in handbooks and curricular material in music education.

Keywords

singing; singing development; singing acquisition; musical development; musical testing

MEMORY ABILITY IN CHILDREN'S INSTRUMENTAL MUSICAL PRACTICE

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Background

The intricate relationship between music and memory is of interest to multidisciplinary perspectives. In the field of music education, performance, and psychology, this theme has been increasingly investigated much more in young and adults than with children, despite the importance of understanding how memory develops as children train to be musicians. Many studies corroborate with the fact that instrumental learning provides a rich collaboration for child development, and different cognitive processes are involved and interact with music making. According to Barry and Hallam to acquire musical skill it is essential to practice. Some research has suggested that attainment simply increases with practice and, consequently, that accumulated practice time can directly predict achievement. Although cumulative practice may be a good predictor of the overall level of expertise attained, it may not predict the quality of performance at any point in time.

Aims

The present research aimed to examine the relationship between the amount and quality of instrumental practice and memory ability in children.

Method

The participants were 52 children—between 6 and 15 years old—who were members of the Pedagogical Experimental Orchestra of NEOJIBA, State Centers of Children, and Youth Orchestras of Bahia, Brazil. The research was divided into two stages. The first stage adopted a descriptive approach in order to record the instrumental musical practice of the orchestra and the routine practice of them over more than one year, including systematic observation, field diaries, recordings, and semi-structured interviews. Thematic analysis approach was employed to encompass the rich collection of data obtained. The second stage of the study sought to answer questions concerning the musical and non-musical memory ability in the participants and the relationship between their memory abilities and musical practice. Memory tests for digit, rhythm, pitch, and timbre sequences were specially developed and applied.

Results

The results of the first stage revealed that most of the participants met the factors proposed by Barry and Hallam. Similarly, most had high performance in the memory tests. In particular, the participants presented a higher score for music information. However, a significant correlation between the two stages of the research was not found, most likely due to the format of the tests.

Conclusions

This difficulty reflects an urgent need to develop new methodological tools (memory tests suitable for children) in order to conduct further research on the subject of musical practice and memory ability in children. Such research could feed directly into music educational practice as well as cognitive memory theory. Specially in Brazil, platforms for the development of research on the field of children's musical practice and cognition are scarce, particularly in the context of collective instrumental performance. There were hardly any parallel possibilities to build up scientific experiments on cognitive musical development, specifically in the context of children's musical practice. Research of this nature would benefit different areas and sub-areas of knowledge such as music education, music performance, and the psychology of music.

Keywords

children; musical practice; orchestra; memory; cognitive strategies

Thematic session
Interdisciplinary performance

MEASURING KNOWLEDGE PRODUCTION IN MUSIC SCIENTIA: A BIBLIOMETRIC ANALYSIS

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Background

Journal publications represent an essential end product of research output for universities, academic institutions, and individual researchers. While journal articles are not the main transferors of knowledge in all academia, peer-reviewed periodicals do constitute a key repository in medical, life and social sciences. The influence of research produced is often measured via impact factor which is a cumulative score based on citation frequency of an article over a given period. Although the process of citation analysis can be a strong indicator of scientific performance, it does not provide scope and depth of the intellectual diversity within a scientific field. In addition to citation potential, articles also contain knowledge about scientific processes, as well as the sociocultural impact of individual and collective human achievement. A corpus of articles in a given field reveals knowledge about knowledge, or meta-knowledge. In empirical and some qualitative forms of research, two types of analyses reveal meta-knowledge on a given subject: meta-analysis or bibliometric analysis. Meta-analyses examine key publications within a field using statistical measurements that can reveal the effectiveness of an intervention. In contrast, bibliometrics quantitatively examine the knowledge structure of research within a field utilizing algorithmic computation. Term co-occurrence analyses, also referred to as co-word maps, analyze words, phrases, and topics, thus highlighting thematic evolution within a specific domain over time.

Aims

Accordingly, the purpose of this study was to proffer bibliometric indicators via term co-occurrences analysis and topic models within a corpus of articles within music research between 1990-2017.

Method

Via the Web of Science Core Collection© digital library (WOS), ~10,000 articles were filtered using search parameters related to music and musicians. Data was then parsed based on WOS categories and publication sources to extract ~6000 articles from which to construct an analysis. Title and abstract within each publication are considered distinct documents in a collection and thus reveal low and high levels of granularity across a text corpus.

Visualisation of Similarity© (VOS) software was utilized to create, visualize, and explore text corpora via 2-D maps of peer reviewed articles related to musicians. The VOS Viewer identifies patterns between publications by the co-occurrence of title and abstract words but also other parameters such as journals, authors, or institutions. Via algorithmic computation, VOS locates elements in low-dimensional space such that the distance between two items reflects the similarity between those elements; thus the stronger the relationship between two elements, the shorter the distance between them.

Conclusions

These findings provide an alternative description of research within a scholarly community of educators, scientists, and medical professionals who research musicians. Publication relatedness rather than impact factor highlights existing, as well as new, connections of mutual interest. By analyzing similarities across texts, the evolution of how research clusters around themes irrespective of one or a group of authors or institutions reveal the diverse topic topology in music research.

Keywords

bibliometrics; meta-knowledge; co-word analysis; visual mapping; topic models

INTERDISCIPLINARY EXPERIENTIAL LEARNING TO FACILITATE THE ACQUISITION AND IMPLEMENTATION OF PERFORMANCE STRATEGIES

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Background

Experiential learning—an approach in which people learn through direct engagement with a phenomenon and then reflect upon that engagement—is increasingly recognized as a key pedagogical tool within higher education. Through exchange between performers, pedagogues, and scientists from across different domains, interdisciplinary experiential learning can offer new, effective means of helping performers bridge the gap in performance training between acquiring and applying knowledge. However, uncertainty remains regarding how best to design, deliver, and capture the impact of experiential learning.

Aims

This project sought to develop, run, and evaluate a series of interdisciplinary experiential learning workshops involving post-graduate performance science and surgical education students with the aim of introducing the students to perspectives on performance-related concepts and practices from other performance domains.

Method

Post-graduated performance science and surgical education students and staff at two UK-based higher education institutions were invited to participate in three interdisciplinary experiential learning workshops comprising: (1) multidisciplinary approaches to training and performing within music, rowing, and business; (2) the use of simulation training for teaching and "performance" preparation within music and surgery; and (3) approaches to practice, rehearsal, and performing within music and surgery. Participants' experiences with seeking to implement learning from the workshops were assessed using the Success Case Method. Participants completed an online survey that examined how they sought to implement learning from the workshops as well as perceived facilitators and barriers to that implementation. Analysis allowed for the identification of particularly successful and unsuccessful implementation experiences. These participants were invited to participate in one-to-one interviews to understand more deeply the design characteristics of interdisciplinary experiential learning workshops that optimally facilitate learning and implementation.

Results

Findings indicated that taking part in the workshops facilitated new insights and understanding. One of the most striking outcomes was how each workshop was reported to challenge participants' assumptions of other performance domains. Participants remarked how they expected that there would be little in common between music, rowing, and surgery. Considerable common ground was found, however, within practice and pedagogic methods, performance experiences, and challenges associated with performances together with strategies for dealing with those challenges. Participants remarked how these altered perceptions and increased awareness impacted upon their attitudes and behaviors relating to their own training and performing. Having the opportunity to actually see and experience other performance domains was perceived to be particularly beneficial for gaining a clearer understanding of those domains and what they might offer to participant's own area of performance. Lack of time and understanding was perceived to hinder participants' ability to fully develop and implement new ideas arising from the workshops.

Conclusions

This presentation will discuss ways via which interdisciplinary experiential learning, blended learning, and action learning can be utilized in the training of performance students. In doing so, this presentation will contribute to the development of models for more impactful use of innovative teaching and learning strategies. It will help refine techniques and protocols that can be implemented with other users across performance disciplines.

Keywords

Acknowledgments

MODELING CROSS-BOUNDARY PERFORMANCE: AN INNOVATIVE RESEARCH AGENDA

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Background

The Centre for Performance Science was established as a partnership between the Royal College of Music (RCM) and Imperial College London in 2015 to investigate performance by traversing traditional disciplinary boundaries. This research takes advantage of the Albertopolis cluster, a unique assembly of scientific, artistic, and historical institutions in central London, building on Prince Albert's nineteenth century vision of the arts and sciences as two faces of a single coin. The RCM, Imperial, Science Museum, Victoria & Albert Museum, and Natural History Museum provide access to an unmatched breadth of practices, objects, and expertise.

Initial work has disclosed striking parallels between science, medicine, music, dance, and other performing arts. It has, for instance, identified performative aspects of laboratory practice (e.g. pipetting, analyzing tissue samples using mass spectrometry imaging) and operative surgery (e.g. preparation for operating, managing stress, high-stakes working), framing these as instances of performance.

This offers an exploratory research agenda aimed at identifying areas of "promisingness" for further investigation. A diverse methodological approach to documentation and analysis draws on approaches within psychology, phenomenology, education, and the social sciences, aiming to develop apt modes of description.

Publications drawing on this work include an article in the Royal Society's *Interface* (2013) on new approaches to measuring performance stress, a series of four essays in *The Lancet* (2017), an essay on the craft of science in *Nature* (2017), and a *Frontiers in Psychology* (2016) exploration of surgery as an instance of performance.

Aims

With this paper, we aim (1) to propose a model of systematic cross-disciplinary enquiry into performance that spans bioscience, medicine, and the creative and performing arts and identifies areas of synergy through collaboration; (2) to contextualize the topic through a summary of progress to date; and (3) to open dialog and stimulate debate within the performance science research community.

Main contribution

A series of case studies provides a framework for enquiry based on initial small-scale collaborations, documented individually but analyzed collectively (within the CPS) to ensure conceptual coherence. These provide preliminary evidence of the value of curiosity-driven research located at the intersection between apparently unrelated domains of expert practice. Examples include: (1) Addressing technical challenges of vascular suturing using techniques from needle-lace; (2) Preparing hard biological materials for non-disruptive spectroscopic imaging using glass-engraving techniques; (3) Using insights from close-up magic performance to enhance recovery of adult patients after sudden head injury; (4) Systematizing pre-performance warm-up routines within surgery, music, and puppetry; and (5) Investigating the challenges of "transient teams" (professionals who are individually expert but have not previously worked together in that configuration) within orchestral and operative performance.

Implications

Cross-boundary performance research may identify new sites for performance science enquiry based on areas of intersection and overlap rather than disciplinary difference. This approach can highlight under-explored and potentially fruitful areas for further research, such as viewing bioscience laboratory practice as performance.

Keywords

cross-disciplinary research; performance; surgery; orchestral performance; transient teams

Thematic session
Piano practice

VISUAL, AUDITORY, AND HAPTIC INFORMATION IN THE PERFORMANCE OF SCALE AND ARPEGGIO TASKS IN PIANISTS

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Background

We previously found that the spatial memory of piano keyboard was not accurate enough to play without external spatial cues even in trained pianists. Therefore, pianists must need real-time acquisition of sensory information on the target key position or some reference points. Furthermore, we observed that amateur pianists made errors without vision and/or auditory feedback when they played excerpts of musical pieces which they were usually able to play confidently by heart. This result indicates that the visual and auditory information contributed to the performance. However, to make clear the roles of information perceived during their performance in various modalities, we need to investigate how pianists' performance are affected by removing each type of information in controlled experimental tasks.

Aims

The aim of the present study was to test how and when the online acquisition of the visual and auditory information contributes to the performance of pianists. We also tried to discuss the contribution of haptic information of the height difference between white and black keys.

Method

Thirteen undergraduate and graduate students majoring piano performance at a university participated in our experiment. They were asked to play the task sequences, which consisted of scale, arpeggio of triads, alternating fourth and fifth, and alternating fourth, fifth, and one octave leap, on an electric piano. The task sequences were played in the C Major key (all notes are on white keys) and the B Major key (five notes are on black keys among the seven notes of one octave). Each pianist played in four conditions: "with-sound-with-vision," "no-sound-with-vision," "with-sound-no-vision," and "no-sound-no-vision." We shielded visual information from the hands and keyboard with glasses with masking tape. Also, the auditory feedback of the performance was removed by setting the sound output of the electronic piano to zero. The performance data was recorded as MIDI data. The notes played and the notes in the score were converted to "position numbers" which represents the key positions, and their correspondence was identified. Two types of performance errors: the position errors (PE) and the moving errors (ME) were counted and analyzed.

Results

When the note sequence was the arpeggio, both PE and ME without visual information were significantly larger than in the case with visual information. In the performance of some of the arpeggio sound types, PE in the case of no sound information was significantly greater only when the visual information was removed. When the visual information was removed, the PE was larger in C Major than B Major.

Conclusions

The role of visual information from the hand and keyboard had a critical role in a performance of arpeggio note sequences. Auditory information, which had effect when the visual information was not available in the performance of specific arpeggios, seemed to contribute partially to the accurate performance. Haptic information become more important in playing piano if visual information is removed.

Keywords

keyboard instrument; piano performance; sensory feedback; spatial accuracy; criteria of performance errors

Acknowledgments

MUSCULOSKELETAL ARCHITECTURE AND THE PIANO PLAYING TECHNIQUE

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Background

A performance is the product of subtle interaction among posture, movement, and emotion, with all aspects dependent on upper-body dynamics to deliver efficient playing actions with a flexible readiness to move the body spontaneously in response to feelings stimulated by the soundscape.

Aims

This review explores the inter-joint dynamics and muscular activity involved in producing an efficient playing technique, and expressive gestures.

Main contribution

Music is actualized and understood through a pianist's body movements, with the whole body involved in delivering the playing actions, or a stable base with firmly anchored pelvis, allowing free arm movement along the keyboard, and trunk movement tracing cycles of tension. The musician's playing movements are the mediator vital to the communication of aesthetic information, influencing observers' perception of the music's expressive intent, and drawing attention to acoustic cues. The underpinning playing technique must be efficient and sustainable so the pianist can give full attention to conveying the musical story, with playing movements expending only the muscular energy needed for a procedure by using body segments according to their design and movement potential. Bones and joints define movement direction and path, and muscles, differing in size, shape, and endurance capacity which varies directly with muscle cross-sectional area, provide the internal force to generate movement, which is moderated by *gravity* and the *mechanical laws*.

Inter-joint dynamics are important for economic movement, and the downswing produced via a wave motion of the multi-joint arm-complex and initiated by shoulder movement, increases efficiency and enables *gravity* to complete the downswing if muscles relax. By using arm weight in this way, muscular energy is transferred from large proximal muscles to smaller, easily-fatigued distal muscles, and the higher the hand above the keys, the greater the *momentum* and *impact force* important in high tempo playing. Coupled shoulder and wrist flexion produces a thrusting forward of the hand, placing the final finger joints in a vertical position which delivers more force for key impact and the hand is lifted by the equal and opposite *key reaction force* in preparation for the next keystroke thereby aiding efficiency.

The hand forms a natural curve over the keyboard through its system of arches giving the hand flexibility and strength. The forearm/wrist/hand form a dependent unit in forearm rotation, an action aiding efficiency when negotiating the linear keyboard to position the fingers for the following keystroke, and forearm rotation causes the upper-arm/elbow, to rotate in the opposite direction. Fingers, curved or straight, allow control of sound quality in communicating expressive features, and, close together or spread, moderate muscle use with the "close" hand aiding the efficiency of lifting the forearm (lever movement), or forearm rotation by reducing the radius of rotation. Audiences respond positively to the arm being active out from the body, frequent hand lifts, and rotational elbow movement (elbow choreography) perceiving them as transmitting grace and beauty, with the expressive level reflected in their amplitude and duration.

Implications

Implications of efficient use of musculoskeletal structures is discussed in relation to the technical and artistic goals of the performance, sitting posture, and potential for injury.

Keywords

piano technique; efficient playing movements; skeletal architecture-arm; muscle mechanics; music biomechanics

HOW PIANISTS MANIPULATE PERFORMANCE PARAMETERS AMONG BACH, SCHUMANN, AND DEBUSSY: EVIDENCE FOR PERFORMANCE PRACTICE

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Background

The literature shows that expert performers manipulate multiple performance parameters (e.g. tempo, dynamics) based on the deliberate interpretation of the structural and the affective content of a piece. In contrast, the empirical knowledge of "performance practice"—a conventional technique for a specific musical era or composer's style—is much less known.

Aims

We aimed at quantifying performance practice. More specifically, we explored how pianists would perform the same scale and arpeggio while simulating expressions typically used in pieces by Bach, Schumann, and Debussy. A machine-learning approach using random forest was adopted to identify performance parameters that could differentiate the pianists' expressions for these composers.

Method

Thirteen pianists aged 24-40 years participated in the experiment. They performed a two-octave, ascending and descending A-major scale and arpeggio with both hands in four renditions: *mechanical* (without any expression), *Bach-like*, *Schumann-like*, and *Debussy-like*. Seven pianists performed the scale first and then the arpeggio; the rest performed the other way around. The scale and the arpeggio were repeated twice and closed by a perfect authentic cadence.

From the digital recordings, the first author obtained the following measures for each rendition of the scale, the arpeggio, and the cadence separately: the tempo (beats per minute), the *nPVI* (normalized pairwise variability index, as an index of rhythmic variability), the silence ratio of each onset curve (estimated by MIR Toolbox on Matlab, as an index for articulation), and the sound-pressure level for each tone (dBA). Moreover, we computed the ratio of the cadence to the scale (or to the arpeggio) and the ratio of the first to the second scale (or arpeggio) as indices of structural variability.

Results

A conditional random-forest analysis was conducted to identify performance parameters that could differentiate the four renditions (i.e. *mechanical, Bach, Schumann, Debussy*). A total of 29 variables were installed as independent variables. The classification error rate was 16.35%, indicating that 73.08-92.31% of renditions were differentiated correctly by these variables. Based on the variable importance measures computed by the random forest, we found that the performer's ID was less important than most performance parameters, indicating that the performers exhibited somehow "common" expressions for the target rendition. The coefficient of variation (*CV*) of tempo for the cadence, the nPVI for the cadence, the cadence-to-scale (or the cadence-to-arpeggio) ratio of tempo, the *CV* of articulation, and the *CV* of tempo were identified as more effective in this order than other parameters in differentiating the renditions.

Conclusions

The present study has empirically proven that the variabilities in tempo, rhythm, and articulation are crucial elements in the pianists' differentiations among mechanical, Bach, Schumann, and Debussy renditions. Earlier studies tended to interpret performances of Bach's pieces as less expressive (or more "mechanical"); however, our results clearly show that even the Bach rendition is distinguished from the mechanical reproduction of the score. The detailed quantifications of performance parameters, such as those in this study, will help us further reveal the science of performance practice.

Keywords

performance practice; tempo; dynamics; articulation; machine learning

Acknowledgments

Thematic session
Violin performance analysis

THE EFFECTS OF LIMITING AURAL FEEDBACK ON INTONATION DURING VIOLIN PERFORMANCE

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Background

One of the most challenging tasks playing a stringed instrument like the violin is to play pitch correctly. It is tempting to make the violin "easier" through an always-in-tune violin, yet it is unclear what impact that would have for transferring learning to an unaltered instrument. Almost all research looking at the effects of altering aural feedback on music performance have been conducted using piano, leading to acceptance of ideas that seem an anathema for violin play. For instance, studies have found removing aural feedback does not have a significant effect on musical performance. However, the piano is a questionable predictor of general musical performance due to its discrete predictable behavior for a given input. Stringed instruments are played through more flexible mechanical interactions, meaning results from experiments using piano may be of limited relevance.

Aims

This research examined the effects of reducing aural feedback on violin intonation: (1) whether limiting aural feedback by removing pitch error around a particular note (pitch correcting feedback) will negatively impact performed pitch; (2) whether altering aural feedback by reducing, but not eliminating pitch error around a particular note (partial pitch correction) will negatively impact performed pitch less than full error removal; (3) whether gradual pitch correction (delaying reduction of aural feedback) will negatively impact performed pitch less than instantaneous error removal; and (4) whether differing levels of experience alter performer reaction to limited aural feedback (both player intonation accuracy and enjoyment).

Method

We used a specially designed augmented violin and software system to provide low-latency pitch corrected audio that replaces acoustic aural feedback with corrected aural feedback. Audio was played through noise blocking headphones. We conducted two studies, one using 8 intermediate to professional adult violinists, and one using 12 beginner violinists including children. In the first study, we tested pitch performance for the first three aims by having violinists play excerpts with three variations of pitch correction strength and three variations of speed of correction (including controls with no pitch correction). In the second study we followed up earlier evidence that skill was linked to perceived experience by testing the effects of the three different pitch correction strengths with beginner students. Qualitative data on experience was collected along with quantitative data from analysis of performed pitch and performer response to Likert questions.

Results

We found that removing a performer's ability to hear intonation error significantly affected performed intonation suggesting that aural feedback does impact player performance error on the violin. Evidence suggested that experts were more effected by the loss of aural feedback than beginners, with both larger drops in performance, and stronger dislike of the experience. Further we found that the level of additional error could be significantly mitigated by restoring partial intonation error with no significant drop in performance experience. There was minimal evidence that delayed correction improved performance.

Conclusions

Limiting aural feedback for violinists will both negatively impact performance and experience, but can be mitigated through partial restoration of intonation error.

Keywords

augmented violin; intonation; aural feedback; performance error

ESTIMATION OF BOWING PARAMETERS IN VIOLIN PLAYING FROM AUDIO ANALYSIS

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Background

The acquisition of musical gestures and particularly of instrument controls from a musical performance is a field of increasing interest in the research area of Performance Science. In the last years, the development of novel sensing technologies has allowed the fine measurement of such controls. However, the acquisition process usually involves the use of expensive sensing systems and complex setups that are generally intrusive in practice. An alternative to direct acquisition is through the analysis of the audio signal recorded in performance. So called indirect acquisition has many advantages including the simplicity and low-cost of the acquisition and its non-intrusive nature. The main challenge is designing robust detection algorithms to be as accurate as the direct approaches.

Aims

This work presents an algorithm for the indirect acquisition of violin bowing controls from audio signal analysis. The estimated controls are which string is played, bowing velocity, bowing force, and bowing distance to the bridge, and they are estimated as continuous signals taking into consideration their evolution in time. The algorithm is able to estimate bowing parameters in real-time, allowing enhanced feedback and self-monitoring of the performance.

Method

The algorithm is based on Convolutional Neural Networks that are trained with empirical data previously collected with a highly accurate sensing system. The training database contains synchronized streams of audio signals captured with a vibration transducer and bowing controls measured with electro-magnetic field sensors.

Results

A numerical evaluation of the algorithm is presented. The evaluation measure is the Correlation Coefficient (CC), which estimates the correlation of the predicted controls against the recorded ground truth by ten-fold cross-correlation of the training dataset. String detection achieves almost 100% correct estimation, which corresponds to a CC of 0.99, bowing velocity achieves a CC of 0.91, bowing force scores of 0.87, and bow-to-bridge distance scores of 0.83.

Conclusions

These results demonstrate that it is in fact possible to estimate the bowing controls from audio analysis based on statistical methods with a relatively small error. However, it should be noted that the current system is trained from recordings of a single violin and with a very specific audio signal, acquired with a vibration transducer built into the violin bridge. The signal captured with such a transducer is cleaner and easier to process than that of a microphone as it minimizes the resonances of the violin body, it avoids room acoustic reflexions, and it is not affected by the motion of the performer or the sound radiation patterns of the violin. The possibility of successfully performing indirect acquisition independently of the microphone and violin still remains uncertain. In the future, training of the models with more general databases including different violins and sound capturing devices will be performed in order to test the generality of the proposed models.

Keywords

violin; bowing; controls; audio analysis

Acknowledgements

PERFORMANCE STYLES AS MANIFESTED IN CONTEMPORARY VIOLIN RECORDINGS: PRELIMINARY INVESTIGATIONS

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Background

The study of violin recordings as evidence of interpretation and performance approach has been quite extensive over the past decades. Major findings such as the limited use of vibrato in early recordings, the gradual decline of audible portamento, or the relative stabilization of rhythm displayed in recordings of the intermediate period are considered fundamental in the identification of prevailing norms of practice and changes of violin performance style which have occurred over time. However, most research has focused on recordings of the early and intermediate periods (circa 1900-1970), with special emphasis on performances of J.S. Bach's Sonatas and Partitas for solo violin.

Aims and Method

This paper reports on preliminary investigations made to detect violin performance aesthetics of the recent decades (1970-present). Following an extensive literature review waged in order to outline trends and changes in contemporary violin playing from a broad perspective, recording analysis (mostly based on aural scrutiny) has been conducted, focused on several present-day violinists performing a wide range of repertoire.

Results and Conclusions

Results point to the extensive blend of stylistic approaches occurring since the rise of the HIP movement, which have fostered a huge palette of performance options. While certain characteristics still serve as acknowledged framework for standard playing, currently active violinists seem to utilize vast options regarding dynamics, articulation, fingerings, bowings, and so forth, widening the spectrum to include bygone idiomatic features together with a constant search for innovations. Such trend could well be observed as being part of a general, quasi-postmodern quest for pluralism and elimination of hierarchical classifications, blurring biographical background and school affiliation in favor of individual idiosyncrasies and personal peculiarities.

Keywords

recording analysis; violin performance; HIP; music interpretation

Thematic session
Performance methods

THE BÖSENDORFER CEUS SYSTEM AS A RESEARCH TOOL FOR PERFORMANCE SCIENCE

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Background

Reproducing pianos have fascinated pianists, audiences, and researchers for over a century and are now readily available for music conservatoires. As they monitor and store the main quantitative parameters of the musical expression performed by the pianist, they are often used to study musical expression scientifically. A recent system introduced by Bösendorfer is the CEUS reproducing system. Like many other reproducing systems, it records and stores note onsets from optical hammer sensors, note offsets, and the exact pedal information. However, as a unique feature, CEUS also monitors the continuous position of each key and stores these position data 500 times per second. These data contain precise information about the particular way a pianist applies force to the keys, a phenomenon referred to by pianists as "piano touch."

Aims

This paper aims to give a stimulating overview on ways to utilize these unique key position data for performance science. Methods to process, analyze, and visualize specific aspects of music expression (i.e. balance and timing of chords) and piano touch are presented, and their potential application in real-world music scenarios are discussed.

Main contribution

An emphasis is given to two expressive features based on key position data: the first regards the dynamic balance and the relative timing of chords. It has been shown that melody tones are emphasized dynamically and sound earlier than softer tones, a phenomenon termed *melody lead*. This is explained by the *velocity artifact hypothesis*, which states that the shorter keystroke times of louder tones cause the hammers to reach the strings earlier than for softer tones, which have longer keystroke times. This hypothesis can be tested easily with the key position data, as it contains detailed timing information of a keystroke movement. A visualization tool is demonstrated that displays dynamic balance and relative timing of chord tones in real time, together with the key position histories, start and end of keystroke movements, and timing statistics.

The second aspect refers to piano touch: the specific way pianists interact with the piano keys. A common criterion to classify piano touch is *percussion* (struck versus pressed touches). From the key position trajectories, also other criteria could be quantified: *weight* (heavy versus light touch), reflected in the position curve after a keystroke (a heavy touch features larger compression of the keybed felt than a light touch), or *rigidity*, a property of struck touches (a rigid touch involves a stiff kinematic chain from arm, wrist, and fingers, resulting in a more abrupt key acceleration compared to a loose touch). Methods to extract, analyze, and visualize these touch features are introduced and demonstrated.

Implications

The CEUS system available at mdw is embedded in a concert grand piano used for numerous study recitals, concerts, and competitions (most recently the 15th International Beethoven Piano Competition, Vienna), potentially offering a wealth of piano performance data waiting to be analyzed. We discuss ways such analysis and visualization methods may be used in the music practice as well as for performance science.

Keywords

reproducing piano; visualization of piano touch; computer-enhanced practice; timing and balance of chords

MIXING METHODS, MODELING TRADITION: NELLO SANTI AND *TURANDOT'S* RIDDLES

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Background

Tradition, especially as it pertains to performance, is central in the operatic world. Long-standing score-, text-, and criticism-based methodologies result in a rich diversity of understandings, but inevitably limit the concreteness with which scholars, performers, or consumers might engage this central concept. One significant lacuna for performance studies is a means of empirically reifying and objectively studying a performance tradition and the persons most responsible for shaping it, whether in opera or in another genre. Three primary factors, drawn in parallel from theoretical and empirical origins, contribute to any individual performer's prominence in such a context: frequency of appearance, emphatic distinction, and consistency of practice. For *Turandot's* "Riddle Scene" at the Metropolitan Opera, conductor Nello Santi meets all three criteria, making this context a fruitful test case for bridging the extant theoretical and empirical divide.

Aims

The primary aim of this paper is to draw links between language or scored based understandings of tradition and empirical techniques for understanding them. Building on a prior semantic analysis, this paper asserts tradition as perceptual, resulting from performance, and different from convention. Clarifying its chief characteristics as behavioral principles facilitates data-driven and digitally-constructed models of tradition as it evolves. Beyond drawing theoretical links, this paper also aims to establish a manner of inquiry that provides a statistical basis for interrogating tradition as a component of musical perception.

Main contribution

Analysis of the musical minutiae in these performances reveals Santi's remarkable consistency despite changing singers over his eleven seasons on the podium, attesting to his influence on the opera's performance history, and in turn, how audiences perceived it. This paper uses beat-to-beat tempo relationships in each of five Santi-led performances, thereby revealing their musical pacing, tempo hierarchy, and temporal-textual emphases. Comparing tempo in Santi's performances and against those of the Met's other *Turandot* conductors establishes the strength of similarity between his performances and others, clearly separating his version from theirs. Moreover, network analysis demonstrates that the performances he led have higher degrees of cohesion with each other than most other combinations of recorded performances, and occupy a central role in *Turandot's* presence on the United States' preeminent opera stage.

Implications

This test case shows how Santi's conducting both markedly altered and moderated what had previously been significantly divergent swings in *Turandot's* performance history at the Metropolitan Opera, further illuminating the significance of performers' onstage or on-podium practices. Furthermore, vector analysis of tempo curves facilitates the construction of data-based models of tradition, allowing a variety of empirical analyses thereof. The methodology supporting these findings represents the flexibility and applicability of a mixed methods approach for examining the traditions connecting operatic performance and consumer perception thereof within and across any number of geopolitical or chronological contexts.

Keywords

opera; performance; tradition; data analysis; experimentation

THE LUCERNE GROOVE RESEARCH LIBRARY: A COLLECTION OF MATERIALS FOR GROOVE STUDIES

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Background

The field of groove studies has seen an increased interest in recent years, but the factors influencing groove are still largely unknown. In order to study the groove phenomenon empirically, the availability of ecologically valid and modifiable acoustic stimuli is of crucial importance. As of yet, no collection of audio or MIDI data has been published that is specifically dedicated to the use in groove studies.

Aims

This paper presents the *Lucerne Groove Research Library*, a corpus of 250 drum beats designed for the use in groove studies. The beats have been extracted from popular recordings, and were played by 50 highly acclaimed drummers in the fields of pop, rock, funk and jazz. The online publication of this collection includes metadata, transcriptions, midi and audio reconstructions, and has been available since August 2017.

Main contribution

Educational textbooks, specialized drum magazines, and websites were researched for lists of drummers and recordings that are considered to be essential to popular music. Additionally, four professional drummers were asked to list the most influential players. From these combined lists, the researchers chose a group of the 50 most frequently mentioned drummers. For each drummer, five recorded tracks were selected based on chart listings, references on webpages, and encyclopaedias. From every track, an 8-bar passage with a repeated beat pattern was transcribed by the researchers. The onset of each drum event was measured using the LARA software, and the loudness of each drum event was classified by the transcribers into four dynamic levels. The transcriptions and measurements were crosschecked in order to clarify divergences among transcribers.

Transcriptions, timing, and dynamics data were converted to MIDI files. This allowed the reconstruction of the drum patterns, using Avid Pro Tools and the Toontrack Superior Custom & Vintage sample library. Metadata include basic information about the drummers and the tracks (e.g. drummer, source recording, recording year), and they present key features of both the original excerpts and reconstructions (e.g. tempo, microtiming, swing ratio, dynamic range, metric salience). The structural features of the drum beat patterns were categorized according to criteria like metric

organization and rhythmic prototypes. These categories are also included in the metadata; they allow researchers to browse the database guided by structural aspects of the drum beat patterns.

Implications

The complete dataset including metadata, midi files and reconstructed audio is available for further research through the website *http://www.grooveresearch.ch*. The website allows structured search, browsing, listening, and download of all data. The authors hope to serve groove scholars by contributing this essential research resource, and they plan to expand it in the future.

Keywords

groove; drums; listening tests; experimental material; dataset

Acknowledgments

Thematic session
Performance education III

VIOLIN PERFORMANCE TEACHING: THE ROLE OF TEACHING CUES

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Background

The instructional process in music performance teaching has been considered a challenge because of the number of interacting factors involved. This process requires the use of several instructional techniques. The interest in these techniques has motivated some authors to investigate new pedagogical approaches. Particularly, a considerable body of research has emerged on this topic, mainly in physical education. In such an area, a concern while teaching a given skill is to demonstrate its critical elements, giving a clear image of the correct movement. The search for achieving this aim has motivated researchers to explore teaching cues. Teaching cues is recognized to help students to focus their attention on key elements of motor skills. Concerning its role, the literature emphasizes that the utilization of teaching cues may improve the focus of attention, comprehension, and retention of information. However, discussion on the use of these cues in music performance teaching has been scarce.

Aims

The aim of this research is to understand the role of teaching cues in violin performance teaching.

Method

In order to reach the research aim, an exploratory case study into the communicative relationship established between violin teacher and student was conducted. The case study involved the observation of 16 one-to-one violin lessons and twelve semi-structured interviews. The participants were four teachers (aged between 41 and 62) and eight violin students (aged between 9 and 15). Two sequential lessons were videotaped, and after the first lesson a semi-structured interview was conducted with teachers and students separately. Based on video observations and on field notes, 28 teaching cues were selected and analysed according to their use and effectiveness. Finally, the teacher's intentions and the student's perceptions of each cue were compared in order to evaluate the efficacy of the identified cues.

Results

The participants used teaching cues to convey different kinds of performance skills, which were classified according to (1) typology; (2) strategies; (3) modes; and (4) functions. Overall, teachers have mainly used teaching cues to explore technical skills, conveying the cues mostly in the middle of a task by both verbal and nonverbal communication. The participants used teaching cues with the intention of advising, problem solving, and emphasizing

pedagogical content. At the same time, teaching cues were communicated effectively when teachers conveyed information with the function of emphasize an important aspect and using the following strategies: (1) using metaphors; (2) demonstrating; (3) physical modelling; and (4) encouraging students to play freely.

Conclusions

The results presented here suggest that teaching cues could be a useful tool to optimize instructional communication in violin performance teaching. When teachers used summarized instruction to alleviate the information overload and guide the focus during the development of skills, students demonstrated a positive understanding and recognition of these actions. In addition, the results demonstrated potential implications for the wider field of music performance teaching.

Keywords

teaching cues; violin teaching; instructional communication; one-to-one instrumental lessons; music performance

Acknowledgments

TEACHER-STUDENT PHYSICAL CONTACT AS A TEACHING STRATEGY FOR MUSICAL INSTRUMENTS

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Background

Of the various gestural behaviors in musical instrument classes that have been described in the literature, physical contact between teachers and students calls for special attention for three main reasons. First, individuals tend to be extremely sensitive to being touched. Second, physical contact appears to provide a platform for teaching the essential haptic contact required to play a musical instrument. Finally, physical contact has suffered the greatest impact from the growing use of virtual technologies for teaching musical instruments. The impossibility of that teaching strategy in such situations raises questions that remain unanswered by the literature.

Aims

This study aims to offer a preliminary investigation on the contribution of physical contact as a strategy for the teaching of musical instruments. Thus, we set guitar master classes as the objects of study, deeming them to represent the one-to-one context, and proposed the following hypotheses: there is a relationship between the use of physical contact as a teaching strategy in guitar master classes and the (1) student's gender, (2) student's performance level, and (3) topic presented by the teacher.

Method

We used a multiple-case study as the methodological design for this study. Therefore, we opted to video record participative observation sessions because it would help in reviewing the data and increase the reliability of inter-observer analysis. In total, 35 guitar master classes were classified into five different levels of student performance ability. Those master classes involved 8 teachers (all males) and 35 students (27 males and 8 females). All the master classes were transcribed and classified according to their main topics.

Results

An ANOVA confirmed that physical contact did not differ by performance level ($F_{4,34}=0.80$, $p=0.54$, $\eta^2=0.10$). In a similar way, a non-parametric t-test showed that physical contact did not significantly differ by student gender ($F_{7,26}=1.67$, $p=0.39$, $\eta^2=0.02$). On the other hand, regarding the topics presented by the teacher, Pearson correlations showed that "nails," "muscle relaxation," and "body posture" are significantly correlated with the physical contact as a teaching strategy.

Conclusions

This study suggested that physical contact as a teaching strategy contributes to the teaching of certain topics inherent to learning to play the guitar. In addition, the results indicate the topics presented by the teacher may have deter-

mined the teacher's gestural behavior. Therefore, researchers in the future might reflect on teaching methodologies for musical instruments that do not allow for teacher–student physical contact as a teaching strategy.

Keywords

music education; musical teaching strategies; physical contact; touch; masterclass

Acknowledgments

FAR-TRANSFER EFFECTS OF INSTRUCTION IN IMPROVISATION WITH MIDDLE SCHOOL BAND STUDENTS DIFFER DEPENDING ON GRADE LEVEL

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Background

Research shows that active music instruction with K-12 populations may enhance academic achievement. This enhancement may be due to better auditory processing in students who participate in music. We believe there are additional possible advantages to active music instruction with a focus on musical improvisation.

Aims

We hypothesized that students who learn to improvise exhibit enhanced cognitive abilities on measures related to flexibility. We tested this hypothesis in a longitudinal study in which middle school students in a large suburban band program completed cognitive tests before and after receiving improvisation instruction.

Method

To test cognitive flexibility, the students completed the full version of the Wisconsin Card Sorting Task (WCST). Cognitive inhibition was tested using the classic Stroop paradigm and working memory was tested using the forward digit span test. The results of the pre-testing showed that students with prior improvisation experience (JAZZ group) made significantly fewer errors on the WCST (M=11.9, n=24) than students in regular concert band (M=14.7, n=141). However, there were no significant differences between the two groups in measures of cognitive inhibition and working memory performance. This would appear to support the hypothesis that experience with jazz improvisation has a far-transfer effect on cognitive flexibility as measured by the WCST.

To address the issue of causation, we devised an instructional intervention that was given to all the students in concert band over two months. Two instructors taught all the students in four separate classes: seventh grade woodwinds, 7th grade brass and percussion, 8th grade woodwinds, and 8th grade brass and percussion. We devised a Music training Control (MC) group that learned jazz articulation and exercises (scales and patterns) required to improvise, but they never actually improvised. The experimental Improvisation Training (IT) group received the same articulation and pattern instruction, but with the added element of using the scales and patterns to improvise. Two of the four classes learned to improvise: 7th grade woodwinds and 8th grade brass and percussion classes. We were not able to randomly assign individual students to experimental and control groups. The 24 students who had previous experience with improvisation in jazz band and the after-school jazz program were separated in the analysis (JAZZ group).

Results

For 7th grade we found significant improvements in inhibition with the IT students but not in cognitive flexibility. Students in the IT group showing faster response times on Stroop incongruent trials after learning to improvise (pre: M=89.40, post: M=61.24) compared to students in the MC group (pre: M=77.66, post: M=93.20). This improvement mirrored the performance of the students in the JAZZ group, who had improvisation training prior to the current study. For 8th grade, we found improvements in cognitive flexibility due to the treatment but not in inhibition. Using percent perseverative errors as a dependent variable, the improvement was significantly more for students in the IT group (pre: M=15.21, post: M=11.52) than for the MC group (pre: M=13.56, post: M=12.72).

Conclusions

In this pilot study, we found improvements in some measures of executive function related to inhibition and cognitive flexibility in students who received music instruction with a focus on improvisation. Interestingly this improvement was seen in different measurements depending on the grade level of the students. Continuing research will investigate related electrophysiological measurements in a similar study design and expand the range of psychological tests. Furthermore, random assignment was not possible in the current study but will be utilized in future research. We believe this is the first study to investigate far-transfer effects of instruction with a focus on improvisation.

Keywords

improvisation; far-transfer; executive function; inhibition; cognitive flexibility

Thematic session
Performer-audience dynamics II

STILLNESS AND MOTION: TWO HYPOTHESES ABOUT AUDIENCE ENGAGEMENT

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Background

A variety of quantitative measures of audience engagement have been tried, amongst others: EEG, fMRI, GSR, heart rate, facial expressions, body movement, eye movements, and self-rated engagement. We propose that these measures of audience engagement can only be fully interpreted by distinguishing between two different basic response processes: cognitive engagement and social engagement. Our proposal is that the typical marker of cognitive engagement in an audience is stillness; blank expressions, motionless bodies whereas the typical marker of social engagement is movement; gesture, facial expression, posture, orientation, and vocalization.

Aims

Our aim is to use the stillness and motion hypotheses to motivate a new understanding the dynamics of audience engagement that can inform empirical analysis, theories of audience response, and the design of the live experience.

Main contribution

We present evidence from the social and cognitive sciences and from studies of live performance which suggest that a basic characteristic of audience engagement is stillness. Obvious counter-examples are easy to find: chanting at football matches, dancing at concerts, laughing at stand-up comedy. We propose that these animated responses reflect the operation of a second process of social engagement which involves the active production of social displays for recognition by others. Live performances are a form of social encounter and in this context people work to make responses that are visible to, and interpretable by, others. These displays are sometimes for performers but also frequently for other audience members. The evidence for this social display process is found in the conduct of everyday social encounters and the pragmatics of performer-audience and audience-audience communication.

Implication

Recognizing the distinction between cognitive and social engagement processes is critical for interpreting what audience response measures mean. For live performance, the validity and status of audience response data depend on knowing the social context; not just whether other people are present but when and how they are interacting. All things being equal, movement suggests boredom when watching alone but interest when interacting with others. More fundamentally, this distinction moves us from a model of audience response as consisting primarily of individual, "internal" reactions toward a model of audience response, an "external" process, in which responses are produced and evolve as part of ongoing social interactions. This creates an opportunity to combine social science and performance in ways that can provide a new basis for the design of live experiences. For example, expanding our

understanding of the physical infrastructure of performance from scenographic narrative to the systematic configuration of patterns of human interaction.

Keywords

liveness; audiences; engagement; interaction; communication

Acknowledgments

AUDIENCE ENGAGEMENT WITH THE ARTS: RECEPTION ACROSS VARIED ORCHESTRAL REPERTOIRE

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Background

As we see lower numbers of potential audience members across the world engaging in the arts, it is crucial to understand where organizations are successful in attracting new and diverse audiences. Success here is often measured through metrics such as attendance numbers/ticket sales and audiences are often categorized into groups for marketing purposes by their general demographics, frequency and influences on attendance. Although recent audience research categorizes motivations for attending concerts, there is little evidence measuring audience engagement across these categories in live performances, specifically on the aspects of intellectual, emotional, and social engagement identified in previous work.

Aims

This project aimed to determine the audience reception of a range of concert repertoire from the same pro-am orchestra, comparing the make-up of audiences across concerts, level of engagement with the repertoire performed, and the value of the arts in general.

Method

A questionnaire was distributed to concertgoers over a series of three concerts: (1) an orchestral symphony concert (n=63), (2) an opera concert performed with a local opera company (n=21), and (3) the orchestra's annual *Messiah* concert, again performed with a local choir (n=21). The questionnaire included items concerning (1) audience demographics, socio-economic status, and frequency of concert attendance; (2) engagement and absorption with the concert performance, reporting on six separate subscales (captivation index, intellectual stimulation, emotional resonance, spiritual value, aesthetic growth, and social bonding); and (3) aesthetic and economic value of the arts in general.

Results

The majority of attendees across all concerts were regular concertgoers, however, significantly more new attendees were present at the *Messiah* concert compared to the symphony concert. The symphony concert attracted significantly more attendees who were regular concertgoers concerning performances by this specific orchestra than the *Messiah* concert. Audience members were generally well educated, with no significant differences in education status between concerts. The majority of audience members decided to attend of their own volition. This was particularly true of the symphony concert, but these differences were not significant. Although all concert attendees registered a high level of captivation, significantly more attendees answered that the performance would leave a long-lasting impression for the *Messiah* concert as opposed to the symphony concert. Attendees who were unfamiliar with the music being performed rated significantly lower levels of intellectual engagement and emotional resonance than those who were familiar, although the average response value for these items was fairly weak across all concerts. The majority of participants agreed with positive statements regarding general attitudes to the arts, although symphony concertgoers agreed with these significantly stronger than the *Messiah* concertgoers.

Conclusions

Orchestras looking to attract new audiences may find that different programs of repertoire (including seasonal events) appeal to broader socio-economic classes and new or irregular attendees. Opportunities to familiarize audiences with the material being performed (e.g. through pre-performance talks) will help to increase the engagement

felt by newer audience members. Results show there is room for improvement in demonstrating to these new audiences the cultural value of the arts.

Keywords

audience reception; arts consumption; engagement; absorption; cultural value

A3: AN AUDIENCE OF PERFORMERS

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Background

Traditionally, musical concerts have the audience as non-performative listeners, passive observers, and receivers of the creation. Music is intrinsically a collaborative art, but new music is often perceived as challenging, and many times generates controversial opinions. New music allows for some non-obvious relationships between composers, performers, and listeners, but no significant empirical research has yet investigated the experiences from the point of view of the audience. Therefore, reflecting and discussing these issues and including the audience in the center of the process allows us a better understanding of how the listening experience might be facilitated, and how a new work is listened to, approached, and/or understood.

Aims

This paper aims to explore ways in which the audience can be integrated in a new music performance, and to analyze the results of this active participation. The objective is to cast further light on how a new music piece communicates with the audience, and try to understand what it means for the individual person in the public to be actively involved in the music making as a performer.

Method

This research was divided in two parts. The first part discusses and gives examples of how the audience was incorporated as a performer in a new music piece, composed by the author of the paper, "a3," for 2 vibraphones and audience. The second section presents the results of three random semi-structured interviews, conducted with audience members, at the end of the performance. The intention of the interviews was to understand how the listening experience was, and what this participation meant in terms of listening and engagement.

Results

Results were analyzed within a qualitative framework, and they explored the relationships between the composition process and the audience's experience. The analyses of the semi-structured interviews identified and defined different themes in the audience's descriptions of their performing experience. It is argued here that engaging the audience in the music making, and exploring this kind of interaction between the musicians and the public, approximates and attracts the audiences to new music and generates greater music meanings. In the interviews it was indicated by the listener-performers that their participation in the piece, even if shy in the beginning, after a while made them more involved in the music, as it engaged their imagination in an emotional way.

Conclusions

Listening to music is always an active process of communication, which involves hearing, interpreting, and creating meaning. The musical piece "a3" was designed in such a way that it invites the audience to become active performers, part of the musical plot as music makers. As the audience role was altered, it allowed space to create a meaningful experience. In a pop rock concert the public knows how to react to the band. Often, this is not the case in a new music concert. In this piece, what was asked opened up a new music experience in the audience, as they had to follow instructions from the musicians, and actively participate in the construction of the sound.

Keywords

music; performance; composition; audience; interaction

Keynote paper

IF MEDICINE IS A PERFORMANCE, THEN WHO IS THE AUDIENCE?
HOW MODERN MEDICINE CAN BE CURED BY STUDYING PERFORMANCE

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Background

The study of performance and the practice of medicine are intricately, albeit awkwardly, linked.

The links are intricate because physicians and performers utilize nearly identical language. For example, physicians and other health care practitioners "perform" medical exams. They "perform" specific medical procedures. They "perform" surgery. Physicians talk about a successful medical encounter much as a professional musician talks about a successful musical performance.

Still, the term "performance" sounds odd and even off-putting to many health care practitioners when one reminds these practitioners that a performance must have an audience. Who is the physician's audience? To whom does the physician owe his or her performance? Is the audience the patient? Is the audience fellow practitioners? Is the audience the profession of medicine itself? Perhaps the audience is solely a narrow adherence to the nuances of physiology? These are questions that are not actively discussed in medical education. Further, performers often note that the response of the audience is intricate to the quality of the performance itself. Is this the same for the performance of clinical medicine? Many providers of health care would argue vehemently that no matter how we conceptualize the desires of the medical audience, the necessary standardization of medical practice confines medical performances to routinized and identical enactments of care.

This keynote will argue that health care practitioners and perhaps especially modern physicians should pay much greater and more explicit attention to these similarities and perhaps awkward comparisons. Doing so will greatly enrich the patient-health care encounter for all parties. Health care practitioners and artistic performers engage daily in profoundly co-created work with each other and with their respective audiences. Indeed, this keynote makes the case that this co-creative process is just as fundamental to the foundation of medicine as it is to artistic performance.

Aims

After this keynote, audience members should be able to: (1) Appreciate the connections between the study of performance and the study of medical practice. (2) Engage in a debate as to how one defines and learns from the medical audience. (3) Understand the extent to which modern medicine has lost sight of the needs of the medical audience. (4) Argue for a greater relationship between health care practitioners and their various audiences through the tenets of performance science.

Main contribution

Fundamental tenets of performance science can reinvigorate the practice of modern medicine.

Implications

Many have argued that practice of modern medicine is increasingly stale and emotionally sterile. Fundamental tenets of performance science can be applied to modern medicine as a cure for both patient and the health care system.

Keywords

physicians; health care providers; performers; audience; co-creations

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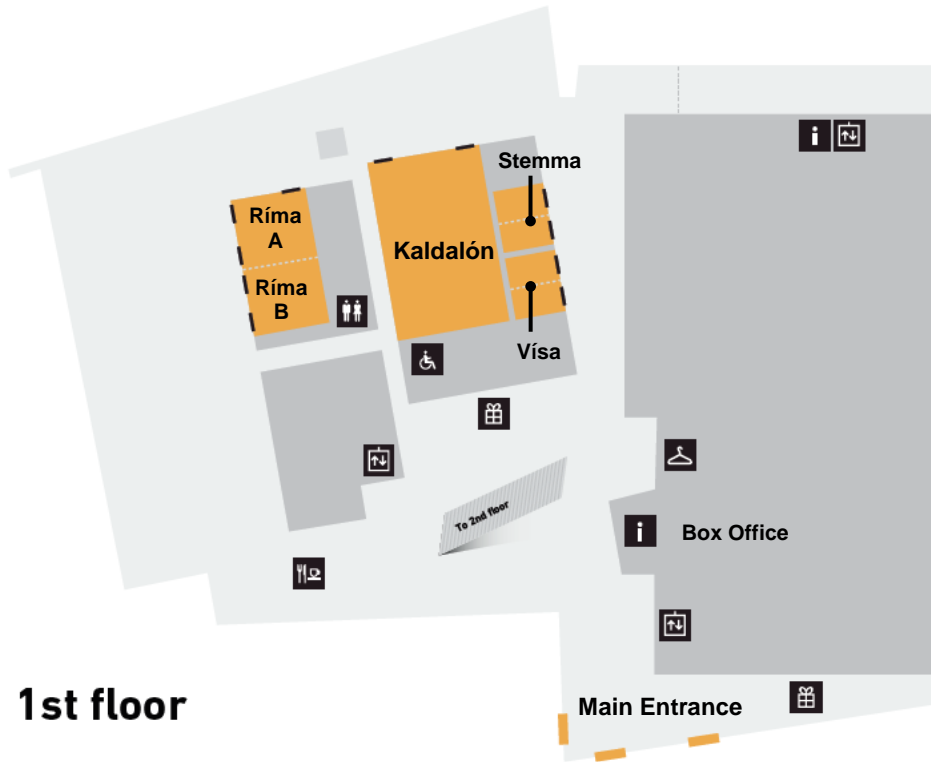
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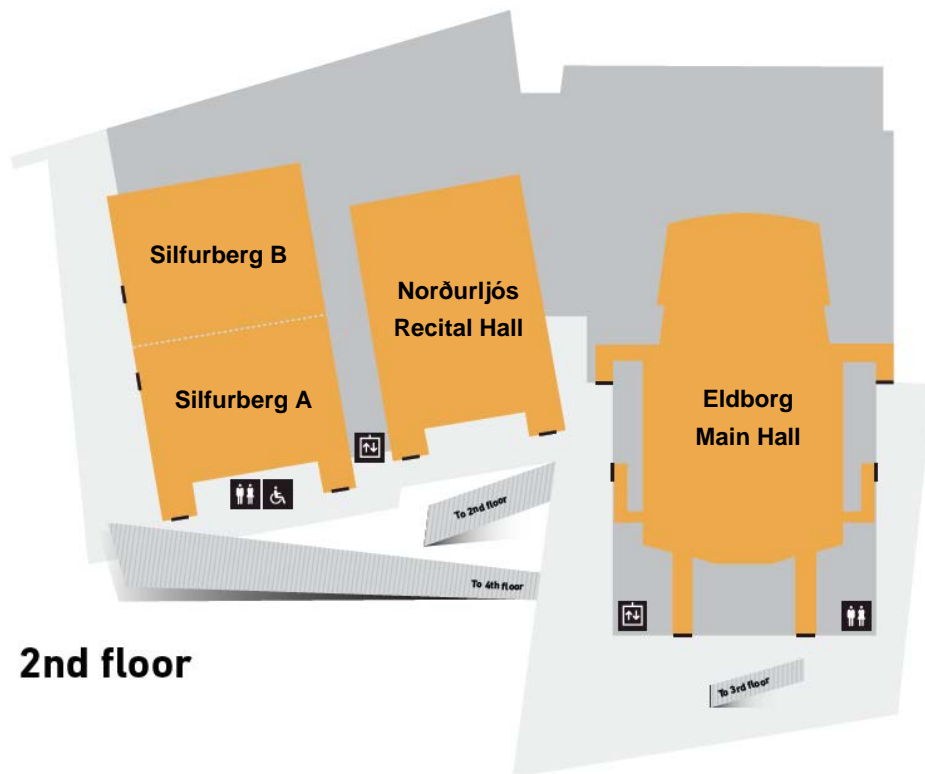
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