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*Organized by*



CITAR, School of Arts  
Portuguese Catholic University, Porto



Centre for Performance Science  
Royal College of Music, London



## Welcome to ISPS 2007

Casa da Música is delighted to host ISPS 2007, the first *International Symposium on Performance Science*. As one of Europe's newest and foremost performing arts venues, we strive to offer a diverse and innovative program of performances, exhibitions, and educational and cultural events of the highest quality. We are pleased, therefore, to lend support to this inaugural conference, which brings together artists and scientists from across the world for an engaging exchange on performance.

On behalf of Casa da Música, the conference organizers, and the ISPS 2007 scientific committee, may I welcome you to Porto. I am sure that this conference will prove both rewarding and enjoyable for all those involved.

Paulo Rodrigues  
Director, Department of Education  
Casa da Música

## Scientific committee

Aaron Williamon, *co-chair*  
Royal College of Music, London (UK)

Daniela Coimbra, *co-chair*  
Portuguese Catholic University, Porto (Portugal)

Emmanuel Bigand  
University of Burgundy (France)

Roger Chaffin  
University of Connecticut (USA)

Jane Davidson  
University of Sheffield (UK)  
University of Western Australia (Australia)

Hubert Eiholzer  
Swiss Italian Conservatory (Switzerland)

Paulo Ferreira-Lopes  
Portuguese Catholic University, Porto (Portugal)  
Center for Art and Media, Karlsruhe (Germany)

Anders Friberg  
Royal Institute of Technology, Stockholm (Sweden)

Francisco Carvalho Guerra  
Portuguese Catholic University, Porto (Portugal)

Hans-Christian Jabusch  
Hanover University of Music and Drama (Germany)

Gary McPherson  
University of Illinois at Urbana-Champaign (USA)

Graça Mota  
ESE, Porto Polytechnic Institute (Portugal)

Richard Parncutt  
University of Graz (Austria)

Helena Rodrigues  
New University of Lisbon (Portugal)

Graham Welch  
Institute of Education, University of London (UK)

## Sponsors

We wish to acknowledge the generous support and assistance of the following organisations:



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## General information for delegates

### Reception and help desk

A registration desk will be situated next to the Box Office of Casa da Música from 09:00-10:30 on Thursday, 22 November. Thereafter, a help desk will be open at the same location until 19:00 on both days of the conference. Anyone outside the conference wishing to leave messages for delegates should telephone +351 220 120 200.

### Delegate pack

Your delegate pack should contain the following:

- delegate badge
- conference program
- conference proceedings
- recital program and ticket
- list of delegates
- pen and notepad
- map of Porto

Additional copies of the conference program will be available at the registration and help desks or downloadable via the conference website, [www.performancescience.org](http://www.performancescience.org).

### Delegate badge

Access to conference sites and meal venues will be by delegate badge only. For security purposes, it is recommended that you wear your badge at all times while at Casa da Música.

### Messages and notice board

A message and notice board will be situated near the help desk. Please check it regularly as any announcements, messages for delegates, and changes to the program will be posted there.

### Meals and refreshments

Refreshments (tea/coffee) and lunch will be available during breaks in the scheduled program (see p.9 for times). The conference dinner will be served from 19:00 at the Taylors Wine Cellars (*address*: Três Séculos, Rua do Choupelo 250, 4400-088 Vila Nova de Gaia, *tel*: +351 223 742 800). Coach transportation to Taylors will be provided at 19:00 in front of Casa da Música, and from Taylors returning to Casa da Música at 23:00.

### Computing facilities

Computers with internet access will be available in Sala de Ensaio 10 (near the help desk and Box Office).

### Assistants and technical support

Conference assistants will be available throughout the event to answer questions and provide general assistance. Each presentation room will have a designated assistant to give technical and logistic help as required.

### Emergencies

The Casa da Música Box Office is situated on the first floor, adjacent to the main entrance, where a first aid kit is located. In the event of an emergency, please notify Casa da Música staff, who will be in attendance in all conference rooms throughout the event. In case of *fire* or if you require an *ambulance*, dial 112 to notify the Emergency Services, then notify the nearest member of staff.

**Notes for presenters***Instructions for presenters of spoken papers*

The time allocated for spoken papers is 20 minutes, with a further 5 minutes for questions and 5 minutes for changeovers. Due to the busy conference schedule, it is important that sessions run to time; therefore, session chairs have been instructed to cut short any papers that overrun 20 minutes. Speakers should ensure that their equipment needs are met *before* the start of the session. Conference rooms will be open 30 minutes before each session, and an assistant will be available to offer help as required.

*Instructions for presenters of posters*

Posters will be displayed for the whole duration of the conference. Each poster has been allocated a number and should be placed on the board corresponding to that number. Posters should be mounted during the registration period (09:00-10:30) on Thursday, 22 November. Assistants will be on hand to provide special adhesive for attaching posters to the boards. The period from 12:15-13:00 on 22 November is specifically set aside for delegates to view posters. No other sessions will take place at this time, and presenters are required to be by their posters to answer questions. Posters will also be available for viewing during refreshment and lunch breaks and should be removed by 16:00 on Friday, 23 November.

## Quick reference timetable

### Thursday, 22 November 2007

09:00-10:30	Registration	
10:30-10:45	Welcome and introduction to ISPS 2007	Sala 2
10:45-11:45	<i>Keynote address</i> Eckart Altenmüller (Hanover University of Music and Drama) From the Neanderthal to the concert hall: Development of sensory motor skills and brain plasticity in music performance	Sala 2
11:45-12:15	Break	
12:15-13:00	<i>Poster session</i>	Corredor Poente
13:00-14:30	Lunch	Bar dos Músicos
14:30-16:00	<i>Thematic sessions</i> Practicing performance Performance analysis I Science of the voice	Sala 2 Sala de Ensaio 3 Sala de Ensaio 1
16:00-16:30	Break	
16:30-18:00	<i>Thematic sessions</i> Learning and teaching I Perceiving performance Performance practice	Sala 2 Sala de Ensaio 3 Sala de Ensaio 1
18:00-19:00	Break	
19:00-	<i>Recital</i>	Sala 2

### Friday, 23 November 2007

09:30-10:30	<i>Keynote address</i> John Gruzelier (Goldsmiths, University of London) Enhancing music and dance performance with EEG neurofeedback	Sala 2
10:30-11:00	Break	
11:00-12:30	<i>Thematic sessions</i> Musicians' health Psychology of performance Performance analysis II	Sala 2 Sala de Ensaio 3 Sala de Ensaio 1
12:30-14:00	Lunch	Bar dos Músicos
14:00-14:45	<i>Graduate award paper</i> Boris Kleber (University of Tübingen) Neural correlates of professional classical singing	Sala 2
14:45-15:15	<i>Announcement of ISPS 2009</i> Sharman Pretty (University of Auckland)	Sala 2
15:15-16:00	Break (with viewing of posters)	
16:00-17:30	<i>Thematic sessions</i> Performance analysis III Physicality of performance Learning and teaching II	Sala 2 Sala de Ensaio 3 Sala de Ensaio 1
17:30-19:00	Break	
19:00-	<i>Conference dinner</i>	Taylors

## Social program

Tours of Casa da Música, in English, will be available for delegates on Thursday, 22 November, at 18:00 and Friday, 23 November, at 18:00. Space is available on a first come first served basis, and delegates should sign-up at the conference help desk. The meeting point for the start of the tour will be the help desk.

A recital by jazz pianist João Paulo Esteves da Silva has been organized for delegates at 19:00 on Thursday, 22 November in Sala 2 of Casa da Música. Delegates will need to display a ticket to gain entry, which is included in the delegate pack. See the recital program (also in the delegate pack) for further details.

The conference dinner will take place at 19:00 on Friday, 22 November at the Taylors Wine Cellars (*address*: Três Séculos, Rua do Choupelo 250, 4400-088 Vila Nova de Gaia, *tel*: +351 223 742 800). Coach transportation to Taylors will be provided at 19:00 in front of Casa da Música, and from Taylors returning to Casa da Música at 23:00.

## Thursday, 22 November 2007

09:00-10:30	<i>Registration</i>	
10:30-10:45	<i>Welcome and introduction to ISPS 2007</i> (Sala 2)	
10:45-11:45	<i>Keynote address</i> (Sala 2) Eckart Altenmüller Hanover University of Music and Drama (Germany) From the Neanderthal to the concert-hall: Development of sensory motor skills and brain plasticity in music performance (p.18) Chair: Paulo Rodrigues	
11:45-12:15	<i>Break</i>	
12:15-13:00	<i>Poster session</i> (Sala 2)	
	Araújo, Almeida, Cruz	Excellence in achievement contexts: Psychological science applications and future directions (p.18)
	Backus, Clark, Williamon	Noise exposure and hearing thresholds among orchestral musicians (p.18)
	Batalha, Macara	Rhythm capacity: Comparison between professional dancers and dance students (p.19)
	Clark, Williamon, Lisboa	The phenomenology of performance: Exploring musicians' perceptions and experiences (p.19)
	Coimbra	Exploring the experience, expression, and control of anger among singers (p.19)
	de Ávila, Zorzal	<i>Appassionata</i> for guitar of Ronaldo Miranda: Relationship between timing variation and musical texture (p.19)
	de Mello	A comparative study: Editions and manuscripts of the Concerto for Guitar and Orchestra by Villa-Lobos (p.20)
	Esteban Muñoz	When gesture sounds: Bodily significance in musical performance (p.20)
	Ginsborg, King	The roles of expertise and partnership in collaborative rehearsal (p.20)
	Gorges, Alpers, Pauli	Musical performance anxiety as a form of social anxiety? (p.20)
	Kreutz	Not quite so healthy: The lifestyles of music conservatoire students (p.21)
	Lopes, Gaspar	<i>Just in Time</i> as a scientific interface between rhythm composition and performance (p.21)
	Mackie	Science meets art: The body and its role in "shaping" piano performance (p.21)
	Oliveira, Cardoso	Control of affective content in music production (p.21)
	Pacheco, Milhano	Learning to be ... singing: A choral music education program (p.22)
	Papageorgiou	Analyzing performance interpretation: The bouncing ball (p.22)

12:15-13:00	<i>Poster session (cont.)</i>		
	Pereira	<i>La cathédrale engloutie</i> : Is musicology changing the way we perform? (p.22)	
	Pertzborn	Motor control and learning: The basics of skilled instrumental performance (p.22)	
	Ribeiro-Pereira	Schubert's lament: Original reading (p.23)	
	Robidas, Mathieu	Integration of improvisation in violin lessons: Why and how to build an accessible and efficient didactic tool (p.23)	
	Rosenkranz, Butler, Williamon	Epidemiology of musician's dystonia: Experience from the London clinic, 2002-07 (p.23)	
	Rosenkranz, Williamon <i>et al.</i>	The tuned brain: Enhanced brain plasticity in musicians (p.23)	
	Sanders	Sensory immersion training for concert artists (p.24)	
	Santos-Luiz	The learning of music as a means to improve mathematical skills (p.24)	
	Tro	From quantitative empiri to musical performology: Experience in performance measurements and analyses (p.24)	
	Vila Verde	Assessing the importance of visual/theatrical features in the perception of music by an audience, using sociological tools (p.24)	
13:00-14:30	<i>Lunch</i> (Bar do Músicos)		
14:30-16:00	<i>Thematic sessions</i>		
	<i>Practicing performance</i> (Sala 2)	<i>Performance analysis I</i> (Sala de Ensaio 3)	<i>Science of the voice</i> (Sala de Ensaio 1)
	Chair: Gary E. McPherson	Chair: Dimitra Kokotsaki	Chair: Francisco Monteiro
	<u>Chaffin, Crawford</u> Unresolved dissonance? Subjectivity in music research (p.25)	<u>Spiro, Gold, Rink</u> Performance motives: Analysis and comparison of performance timing repetitions using pattern matching and Formal Concept Analysis (p.25)	<u>Barlow, LoVetri, Howard</u> Voice source and acoustic measures of girls singing "classical" and "contemporary commercial" styles (p.26)
	<u>Lisboa, Chaffin <i>et al.</i></u> Variability and automaticity in highly practiced cello performance (p.25)	<u>Earis, Holmes</u> The role of timbre in expressive musical performance: A case study of Bach's Prelude BWV 998 played on the acoustic guitar (p.26)	<u>Clift, Hancox <i>et al.</i></u> Choral singing and psychological wellbeing: Findings from English choirs in a cross-national survey using the WHOQOL-BREF (p.26)
	<u>Ginsborg, Chaffin</u> The effect of retrieval cues developed during practice and rehearsal on an expert singer's long-term recall for words and melody (p.25)	<u>Lourenço</u> Tendencies of piano interpretation in the twentieth century: Concept and different types of piano interpretation schools (p.26)	<u>Lã, Harper, Carvalho</u> The effects of the menopause and the use of hormonal replacement therapy on the female professional voice users' perceptions (p.27)
16:00-16:30	<i>Break</i>		

16:30-18:00	<i>Thematic sessions</i>		
	<p data-bbox="427 398 678 459"><i>Learning and teaching I</i> (Sala 2)</p> <p data-bbox="435 470 670 499">Chair: Sharman Pretty</p> <p data-bbox="491 521 614 551"><u>McPherson</u></p> <p data-bbox="387 555 710 616">Diary of a child musical prodigy (p.27)</p> <p data-bbox="491 667 614 696"><u>Papageorgi</u></p> <p data-bbox="387 701 710 851">The influence of the wider context of learning, gender, age, and individual differences on adolescent musicians' performance anxiety (p.27)</p> <p data-bbox="435 902 662 931"><u>Mota, Gonçalves <i>et al.</i></u></p> <p data-bbox="387 936 710 1025">Composing with <i>Hyperscore</i> in general music classes: An exploratory study (p.27)</p>	<p data-bbox="770 398 1021 459"><i>Perceiving performance</i> (Sala de Ensaio 3)</p> <p data-bbox="762 470 1029 499">Chair: Emmanuel Bigand</p> <p data-bbox="818 521 973 551"><u>Gerling, Santos</u></p> <p data-bbox="762 555 1029 616">Intended versus perceived emotion (p.28)</p> <p data-bbox="858 667 933 696"><u>Harper</u></p> <p data-bbox="730 701 1061 824">Golden Section in the sonatas of Domenico Scarlatti: An examination of Kirkpatrick's crux (p.28)</p> <p data-bbox="842 902 949 931"><u>Martingo</u></p> <p data-bbox="730 936 1061 1025">Making sense out of taste: A study on listeners' preferences of performed tonal music (p.28)</p>	<p data-bbox="1125 398 1348 459"><i>Performance practice</i> (Sala de Ensaio 1)</p> <p data-bbox="1129 470 1343 499">Chair: Roger Chaffin</p> <p data-bbox="1161 521 1316 551"><u>Fine, Ginsborg</u></p> <p data-bbox="1098 555 1380 645">How singers influence the understanding of sung text (p.28)</p> <p data-bbox="1090 667 1388 696"><u>Gingras, McAdams, Schubert</u></p> <p data-bbox="1082 701 1396 884">Effects of musical texture, performer's preparation, interpretative goals, and musical competence on error patterns in organ performance (p.29)</p> <p data-bbox="1145 902 1332 931"><u>Arrais, Rodrigues</u></p> <p data-bbox="1090 936 1388 1059">Cognitive feedback and metaphors in emotional communication instruction of musical performance (p.29)</p>
18:00-19:00	<i>Break</i>		
19:00-	<p data-bbox="858 1115 933 1144"><i>Recital</i> (Sala 2)</p> <p data-bbox="754 1182 1037 1211">João Paulo Esteves da Silva</p>		



## Friday, 23 November 2007

09:30-10:30	<p><i>Keynote address</i> (Sala 2)</p> <p>John Gruzelier Goldsmiths, University of London (UK)</p> <p>Enhancing music and dance performance with EEG neurofeedback (p.32)</p> <p>Chair: Aaron Williamon</p>			
10:30-11:00	<p><i>Break</i></p>			
11:00-12:30	<p><i>Thematic sessions</i></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center; vertical-align: top;"> <p><i>Musicians' health</i> (Sala 2)</p> <p>Chair: Hans-Christian Jabusch</p> <p><u>Clemente, Carvalho et al.</u> Orofacial considerations concerning musicians (p.32)</p> <p><u>Grahame</u> Joint hypermobility is a liability for the performing artist (p.32)</p> <p><u>de Lisle</u> The role of retraining in rehabilitation from focal dystonia (p.33)</p> </td> <td style="width: 33%; text-align: center; vertical-align: top;"> <p><i>Psychology of performance</i> (Sala de Ensaio 3)</p> <p>Chair: Jane Ginsborg</p> <p><u>Gregg, Clark</u> Theoretical and practical applications of mental imagery (p.33)</p> <p><u>Haddon</u> What does mental imagery mean to university music students and their professors? (p.33)</p> <p><u>Ritchie, Williamon</u> Measuring self-efficacy in music (p.33)</p> </td> <td style="width: 33%; text-align: center; vertical-align: top;"> <p><i>Performance analysis II</i> (Sala de Ensaio 1)</p> <p>Chair: Luísa Tender</p> <p><u>Monteiro</u> Virtuosism: Some (quasi phenomenological) thoughts (p.34)</p> <p><u>Pipa</u> The art of hand-splitting: Vianna da Motta's contribution toward a better rendering of Beethoven's sonata op.31/2 (p.34)</p> <p><u>Matta</u> Fernando Lopes-Graça's choral music: Characteristics and interpretation (p.34)</p> </td> </tr> </table>	<p><i>Musicians' health</i> (Sala 2)</p> <p>Chair: Hans-Christian Jabusch</p> <p><u>Clemente, Carvalho et al.</u> Orofacial considerations concerning musicians (p.32)</p> <p><u>Grahame</u> Joint hypermobility is a liability for the performing artist (p.32)</p> <p><u>de Lisle</u> The role of retraining in rehabilitation from focal dystonia (p.33)</p>	<p><i>Psychology of performance</i> (Sala de Ensaio 3)</p> <p>Chair: Jane Ginsborg</p> <p><u>Gregg, Clark</u> Theoretical and practical applications of mental imagery (p.33)</p> <p><u>Haddon</u> What does mental imagery mean to university music students and their professors? (p.33)</p> <p><u>Ritchie, Williamon</u> Measuring self-efficacy in music (p.33)</p>	<p><i>Performance analysis II</i> (Sala de Ensaio 1)</p> <p>Chair: Luísa Tender</p> <p><u>Monteiro</u> Virtuosism: Some (quasi phenomenological) thoughts (p.34)</p> <p><u>Pipa</u> The art of hand-splitting: Vianna da Motta's contribution toward a better rendering of Beethoven's sonata op.31/2 (p.34)</p> <p><u>Matta</u> Fernando Lopes-Graça's choral music: Characteristics and interpretation (p.34)</p>
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12:30-14:00	<p><i>Lunch</i> (Bar dos Músicos)</p>			
14:00-14:45	<p><i>The Francisco Carvalho Guerra graduate award paper</i> (Sala 2)</p> <p>Boris Kleber University of Tübingen (Germany)</p> <p>Neural correlates of professional classical singing (p.34)</p> <p>Chair: Daniela Coimbra</p>			
14:45-15:15	<p><i>Announcement of ISPS 2009</i> (Sala 2)</p> <p>Sharman Pretty University of Auckland (New Zealand)</p>			
15:15-16:00	<p><i>Break</i> (with viewing of posters)</p>			

16:00-17:30	<p><i>Performance analysis III</i> (Sala 2) Chair: Ângelo Martingo</p> <p><u>Prem, Parncutt</u> The timbre vocabulary of professional female jazz vocalists (p.35)</p> <p><u>Pereira</u> Authenticity in the twentieth century: Listening to composer's own recordings (p.35)</p> <p><u>Fabiani, Friberg</u> A prototype system for rule-based expressive modifications of audio recordings (p.35)</p>	<p><i>Thematic sessions</i></p> <p><i>Physicality of performance</i> (Sala de Ensaio 3) Chair: Philip Fine</p> <p><u>Jabusch, Yong, Altenmüller</u> Biographical predictors of music-related motor skills in children pianists (p.36)</p> <p><u>Williamson, Roberts et al.</u> The role of the Alexander technique in musical training and performing (p.36)</p> <p><u>Salgado</u> Kinesics analysis in the investigation of the emotion expression in music performance (p.36)</p>	<p><i>Learning and teaching II</i> (Sala de Ensaio 1) Chair: Graça Mota</p> <p><u>Kokotsaki</u> PGCE music students' perceptions of the benefits of their musical involvement outside of school (p.37)</p> <p><u>Heuser</u> A theoretical framework for examining foundational instructional materials supporting the acquisition of performance skills (p.37)</p> <p><u>Macara, Batalha</u> Youth and dance: Relation of university students with different types of dance (p.37)</p>
17:30-19:00	<i>Break</i>		
19:00-	<i>Conference dinner</i> (Taylors Wine Cellars)		

## **Abstracts**

**Thursday, 22 November 2007**

# Keynote paper

## **From the Neanderthal to the concert hall:**

### **Development of sensory motor skills and brain plasticity in music performance**

*Eckart Altenmüller*

For thousands of years, humans have striven to express and communicate their feelings by singing and playing musical instruments. In order to create new sounds, instruments were invented requiring novel and frequently complex movement patterns. Sensory-motor skills of musicians have some specific qualities: learning begins at an early age in a playful atmosphere. Routines for stereotyped movements are rehearsed for extended periods of time with gradually increasing degrees of complexity. Via auditory feedback, the motor performance is extremely controllable by both performer and audience. These specific circumstances seem to play an important role for plastic adaptations of the central nervous system. Training-induced changes include both brain function and brain structure and can be observed in sensory-motor and auditory networks. However, in the last two centuries increasing specialization and, as a consequence, prolonged training have produced dysfunctional adaptations of the brain, leading to secondary deterioration of movement patterns referred to as musicians' dystonia. This disorder could mark the final point of human evolution of sensory motor skills.

# Poster Session

## **Excellence in achievement contexts:**

### **Psychological science applications and future directions**

*Liliana S. Araújo, Leandro S. Almeida, and José F. Cruz*

The study of human excellence has always been present in the development of psychological science, although its theory, research, and practice focus have been mainly on negative and pathological issues. Many authors have attempted to explain and understand youth and adults' exceptional achievements in several achievement domains, such as science, art, or sports. Here, we consider three main different approaches that study excellence. There are those which focus on natural talent, those which propose intensive training and practice as main factors of high and outstanding performances, and those which define excellence in the context of wisdom. Analyzing the current literature, we can distinguish training, deliberate practice, and exceptional performance specificity resulting from a precocious involvement and commitment to a specific domain as main points of convergence. Cognitive, motivational, affective, and personality characteristics, as well as contextual elements such as learning experiences and supportive environments, are emphasized as crucial factors in the developmental process of excellence. This concern and interest in human excellence appears to be shared by professionals from different domains. New challenges for future research in this field are presented.

## **Noise exposure and hearing thresholds among orchestral musicians**

*Bradford C. Backus, Terry Clark, and Aaron Williamon*

An assessment of noise exposure and hearing thresholds among orchestral musicians was carried out at the Royal College of Music (RCM). Sound exposure data was taken over a one week period using personal noise dosimeters attached to ten RCM orchestra students during rehearsals and during a performance (Rachmaninoff's *Piano Concerto No. 2* and Sibelius's *Symphony No. 2*). Noise levels (and compliance with the UK's noise at work regulations) depended upon the type of instrument being played and where musicians were seated. For example, the average 8-hour A-weighted dosage for the trumpet was  $L_{EP,d}=88.4$  dB(A), while it was only 77.1 dB(A) for the double bass. This suggests that different hearing protection strategies may be appropriate for different musicians. Audiogram data taken from 37 students and 19 staff showed that the students (mean age=24.2, SD=4.0) had statistically significant bilateral notches at 6 kHz, indicative of noise-induced hearing loss. Staff members (mean age=45.7, SD=11.0) also had evidence of notches and additionally presented increased thresholds at high frequencies, indicative of expected age-related hearing loss.

### **Rhythm capacity: Comparison between professional dancers and dance students**

*Ana Paula Batalha and Ana Macara*

We all have the intuition that different rhythmic factors and different people exhibit different rhythmic behaviors. A sample of professional dancers and university dance students was recruited for this study. Our methodology was based on the application of a specifically built and validated set of questionnaires. This battery of tests was previously applied to young people practicing dance. In the present study, we found no significant differences between the rhythmic factor or synchronization, or between male and female participants. However, when the rhythmic factor involved the reproduction of particular moves, significant differences were found.

### **The phenomenology of performance: Exploring musicians' perceptions and experiences**

*Terry Clark, Aaron Williamon, and Tânia Lisboa*

The present study explored musicians' perceptions and experiences in performance. Specifically, four areas were investigated: (1) the different types of preparation and pre-performance routines in which musicians engage, (2) musicians' thoughts and perceptions of both themselves and their environment while performing, (3) the musical, psychological, and non-musical skills deemed essential for success, including the means by which such skills are acquired, and (4) the types of demands and stressors that musicians face, along with the strategies they employ to manage them. Thirteen student and professional musicians were interviewed. Content analysis was performed using Interpretive Phenomenological Analysis which elicited three general themes: motivation, preparation, and performance experiences. Differences emerged between experienced and less experienced musicians in terms of the breadth and scope of preparation activities for the more experienced musicians. Greater similarities between the participants were found when discussing factors surrounding successful and less successful performances. Successful performances were often connected with feelings of sufficient preparation, positive mindsets, and presented a high yet attainable level of challenge, while less successful performances appeared linked with inadequate preparation, negative mental outlooks, frustration, and lack of enjoyment during the performance itself.

### **Exploring the experience, expression, and control of anger among singers**

*Daniela Coimbra*

The aim of the present work was to explore the experience, expression, and control of anger of a group of 54 singers at a music college who completed a normative state-trait anger expression inventory (STAXI-2, Spielberger 1999) prior to and after the performances of their mid-year examinations. Both female and male singers differed from their normative groups on the Anger Expression-In scale, which was interpreted in terms of the need to refrain from expressing anger overtly in a competitive and hierarchical system such as that of a music college. In addition, female singers also scored lower in the Anger Control-In scale, which indicates that they experience angry feelings but show a tendency not to develop internal controls to overcome those feelings. The results also showed that there were no significant differences between the singers' State Anger levels prior to and after the performances which indicates that the mid-year examinations did not raise the singers' levels of anger.

### ***Appassionata* for guitar of Ronaldo Miranda: Relationship between timing variation and musical texture**

*Guilherme Augusto de Ávila and Ricieri Carlini Zorzal*

The aim of this study was to analyze four commercial recordings of the theme *Lirico e molto espressivo* from Miranda's *Appassionata* for solo guitar. It intends to verify the mathematical behavior of timing variation as a function of the indication of the composer, in two phrases with two parts, each of which contains distinct textures. The selected theme has in its first motif a defined melody and in the second motif an improvised character. Using computer software, the IOIs related to the time unit were obtained. The first group (G1) contained the data regarding the texture of the defined melody, while the second group (G2) contained the data regarding the texture of improvised character. Analysis of variance (ANOVA) verified a significant relationship between the timing variation of the interpreter's performance and the indication from the composer. We conclude that the parabolic curve behavior depends on the structural function of the motif of the phrase. G1 was over-valued by the significant increase in the duration of the notes due to their higher structural importance. G1 tended to have a tighter and slower timing pattern than what was indicated by the composer, and G2 tended to have a higher timing liberty pattern due to their more improvised characteristic.

### **A comparative study: Editions and manuscripts of the Concerto for Guitar and Orchestra by Villa-Lobos**

*Ricardo Camponogara de Mello*

This research involved a comparative study among three edited versions of Max Eschig and two manuscripts of the *Concerto for Guitar and Orchestra* by Heitor Villa-Lobos in this article. This was accomplished through a simultaneous comparison among the versions. As a result of this study, a series of divergences emerged and are pointed out. Such study allows us a new look before the piece, increasing its execution possibilities and aiding the interpreters positioning in the performance.

### **When gesture sounds: Bodily significance in musical performance**

*Elena Esteban Muñoz*

*When gesture sounds* is a specific reflection about the awareness of expressive movement as a meaningful and complementary element of sound in live musical performance. Given that movement is the motor of sound and intention the impulse of gesture, the inevitable connection between intentional bodily movements and music emerges, allowing us to establish synaesthesia channels which influence expressiveness, understanding, and communication in performance events. This study expounds an approximation to the cognitive aspects of gesture and its significance in relation to musical practice and perception, considering players and audience. The idea that gesture could act as a visual stimulus to perform and perceive music in a particular way is defended. "Times" of gesture are evaluated, with their implicit intentions and meanings. Finally, an incursion into pedagogy intends to examine what of gesture could be taught and, if so, how.

### **The roles of expertise and partnership in collaborative rehearsal**

*Jane Ginsborg and Elaine King*

The cognitive and social processes underlying collaborative rehearsal were explored in a case study using four singer-piano duos, two professional and two student groups. Participants rehearsed one song with their regular partners, a second song with a new partner of the same level of expertise, and a third song with a new partner of a different level of expertise. Verbal discourse during rehearsal was analysed to determine (a) styles of interaction and (b) salient musical dimensions. In the regular and new same-expertise partnerships, the professionals were more likely to give opinions than the students, much of whose talk concerned orientation about the song. In the new mixed-expertise partnerships, the professionals initiated more exchanges and offered more opinions than the students. Socio-emotional behavior reflected tension release, and the pianists gave frequent statements of solidarity to the singers. Basic, interpretive, and expressive musical dimensions were salient, as in previous studies. A range of rehearsal strategies was identified, although the most common was working from the beginning to the end of the song. Future research aims to identify other effective short-term rehearsal strategies and the use of physical gestures in collaborative practice.

### **Musical performance anxiety as a form of social anxiety?**

*Susanne Gorges, Georg W. Alpers, and Paul Pauli*

The aim of the current study was to investigate the relationship between social anxiety and musical performance anxiety (MPA). Previous literature has reported mixed results concerning correlations between social anxiety and MPA. To better describe overlapping and unique features in comparison with social anxiety disorder may introduce new options for treatment. The aim of the current study was to explore if performance anxiety only, or also the fear of social interaction, predicts MPA and if there are additional predictors beyond social anxiety. One hundred and forty-two music students and professional musicians participated in the study. In addition to questionnaire measures of MPA and social anxiety, we assessed perfectionism, self-focused attention, and absorption as possible predictors. Social anxiety correlated highly with MPA. In a regression analysis only the subscale performance anxiety, not fear of social interaction, predicted MPA. Moreover, social anxiety only partially predicted MPA; perfectionism and public self-focus significantly increased the explained variance. We conclude that social anxiety and MPA are strongly related but are also unique in many ways.

**Not quite so healthy: The lifestyles of music conservatoire students**

*Gunter Kreutz*

The general health-promoting behaviors and health problems of students at music conservatoires were investigated via an online survey completed by a total of 272 students from the Royal Northern College of Music (RNCM, n=199) and the Royal College of Music (RCM, n=73). The Health-Promoting Lifestyles Profile (HPLPII) was administered in combination with an ad hoc inventory on musculoskeletal pain and selected psychosomatic problems. The present study further explores (a) the differentiation of subgroups of the sample on the basis of levels of self-reported health-promoting behaviors and (b) the influence of musculoskeletal (MS) and non-musculoskeletal (NMS) problems on practice and performance quality. Cluster analysis of participants' responses identified one group performing above and one group below average for scores representing the frequency of engagement in health-promoting behaviors. No differences were found between these groups in relation to other health-related variables. Concurrent health issues, especially when MS and NMS problems occurred simultaneously, significantly influenced self-reported practice and performance quality. These results suggest that healthy lifestyles *per se* do not predict the amount of actual health issues. The accumulation of health problems, however, has measurable subjective influence on practice and performance quality.

**Just in Time as a scientific interface between rhythm composition and performance**

*Eduardo Lopes and Paulo Gaspar*

In apparent contradiction to the commonly addressed "naturalness" of rhythm and its intrinsic relation with humans, the study of this music parameter has received only modest attention from the Western theory of music, as compared with the study of pitch issues (in the form of melody and harmony). Throughout the history of Western music, composers and performers developed the articulations of temporal structure to a remarkably high level of imaginative skill and proficiency in matters effecting phrase lengths, rhythmic combinations, and the architectonics of music and structural proportions. From a rhythmic point of view, however, these practical achievements were rarely matched or accompanied by theoretical consideration of the problems they faced or the solutions at which they arrived: rhythm and meter were generally seen as subordinate to pitch structure. Using the rhythmic theoretical tool *Just in Time*, this paper presents a rhythmic analysis of the first part of the A section of the jazz tune *After You've Gone* by Creamer e Layton, as well as Benny Goodman's improvisation in the same section. Within the context of composition/notation (original tune), and improvisation/performance (Goodman's version), the proposed rhythmic model provides useful insights about some of the processes involved in rhythmic composition and performance.

**Science meets art: The body and its role in "shaping" piano music**

*Cristine MacKie*

This paper seeks to show that the body of the pianist may have a role to play in "shaping" musical works for performance. This view is now supported in musical academic circles who wish to promote a more interdisciplinary approach to performance. The argument is presented in three stages as follows. First, "Human Movement Systems" explores how order emerges in such a complex system as the body. Second, "Shaping Musical Performance" examines the most important conceptual challenge a pianist can face, which is how to shape a musical work for performance; a simple "performative" analysis is devised which exposes the structural elements of the music which support its shape. In the final stage, both approaches are shown to converge and complete the performative analysis as a design which may be used during the preparation of a musical work for performance.

**Control of affective content in music production**

*António Pedro Oliveira and Amílcar Cardoso*

Music is a ubiquitous media in our lives, used in many contexts. The possibility to select appropriate affective music can be helpful to adapt music to our emotional interest. Our work intends to design a system to control affective content in music production. This is done by taking into account a knowledge base with mappings between affective states (e.g. happiness, sadness) and music features (e.g. rhythm, melody). The knowledge base is grounded on background knowledge from music psychology. Our system starts with the reception of an emotional description specified by the user. Next, mappings are selected from the knowledge base, according to the emotional description. Music is retrieved from a music base (recorded sound and MIDI files) according to similarity metrics between music features (of mappings and music base). Afterward, selected music can be subject to transforming, sequencing and remixing algorithms, and then played. The inclusion of third party composition software is also envisaged. To assess the system, listener emotional state can be analyzed using psychophysiological or self-report measures.

**Learning to be...singing: A choral music education program**

*Luis Miguel Simões Pacheco and Sandrina Dinis Fernandes Milhano*

The purpose of this paper is to share the success story of a choral music education program for children and youth, to discuss its benefits to members, and to relate the results to current best practice and research. Beyond its musical and artistic purposes, the Coral Polifónico Juvenil intended to promote on its members, aged between 10 and 16 years, the development of personal, interpersonal, and social skills. The most important findings are that the musical participation in the choral activity has had very positive impacts on pupil's perceptions, attitudes and beliefs toward music in general and toward choral music participation at school. The pupils felt important, happy, and more useful as well as appreciated by their colleagues at school, by their families, and their communities. They expressed a sense of responsibility and conscientiousness, with notions of values of persistency and perseverance. Regarding interpersonal benefits, they acknowledged in these activities an excellent chance to relate themselves with others and to enlarge their cultural and musical experiences. The pupils recognized that their participation in the choral activity provided them with opportunities to develop their personal, social, and cultural skills and knowledge, as well as providing them with other professional perspectives.

**Analyzing performance interpretation: The bouncing ball**

*George Papageorgiou*

In this paper, I propose an analytical method for recorded music that encourages connection between musical and physical movement. Through detailed analysis of the structure (both compositional and performed) of the music, the particularity of specific performance interpretations is captured by analogy with the motion of a bouncing ball. This is achieved by means of a mapping of the two elements of musical motion—"musical tension" and "rhythmic drive"—onto those of the bouncing ball motion: height and speed. This method provides not only a way of describing musical expression in a more systematic way but also a pedagogical tool to cultivate sensitivity to the rhythmic and expressive subtleties of music. A graphic notation system is presented along with ideas for the creation of a computer program to realize this bouncing ball animation.

***La cathédrale engloutie*: Is musicology changing the way we perform?**

*Rui Pedro Pereira*

The recording of *La cathédrale engloutie* by Debussy himself revealed important differences between the score and the way he performed the music. This gave rise to a series of studies in musicology and to the posthumous correction of the score. The aim of the present work is to question the impact of musicological studies on performance practice. An overview of the most important documents concerning *La cathédrale engloutie* is presented, from the time when the work was published until the present. In addition to this, 38 recordings were examined to ascertain how performers played the work over this period. The results showed that Debussy's recording itself did not have a direct impact on the way performers play *La cathédrale engloutie* and that only after the score was rectified pianists gradually started changing the way they performed the work. The study confirmed the historical importance of Debussy's own recording, as well as the importance of the musicological studies for performance practice. However, the study also revealed that these findings take a long time to become known and accepted among professional pianists.

**Motor control and learning: The basics of skilled instrumental performance**

*Florian Pertzborn*

This paper introduces some concepts from the field of motor learning and their possible applications to the doublebass. Basic issues of motor performance and perceptual-motor integration form a proposal to enhance skilled instrumental performance. Posture and motion are analyzed under principal guidelines of human ergonomics. Movements used in doublebass performance are abridged to the concept of the pendulum motion. Three topics form a concluding part and give suggestions to enhance skilled instrumental performance. While this investigation is focused on issues of doublebass performance, it might be also extended to other instruments, especially those which require bi-manual movement production and acquisition.

### **Schubert's lament: Original reading**

*J. Miguel Ribeiro-Pereira*

The *topos* of lament is expressed upon the idiosyncratic leading-tone polarity of the minor mode (scale degrees 5-*b*6-5). I have traced both its evolving manifestations and critical significance in tonal music, syntactic as well as systemic, from Monteverdi's *Lamento d'Arianna* to Mahler's *Kindertotenlieder*. A new cognitive model was put forth therein, that is based on the paradigm of harmonic modulation as an essentially plastic process. Following Beethoven's lead, Schubert developed a consistent chromatic approach to the mixture of modes (major-minor parallel keys). In his lieder, particularly, he was to cast and coin the old lament-motive tradition in the context of the early-Romantic aesthetics, while further extending the critical role of the flat-submediant region and the attendant major-third relationship (I/I-*b*VI). The present study attempts to explain how Schubert's musical interpretations (or readings) of Rückert's "Du bist die Ruh" and "Lachen und weinen" aptly represent, and actually enhance, the core meaning of the poems. Of course, the paradigm of harmonic modulation will be applied thereto. The qualifier "original" in the title has a twofold meaning: it denotes a novel analytical approach to the composer's settings; these, in turn, were the source of (or role model for) subsequent developments.

### **Integration of improvisation in violin lessons: Why and how to build an accessible and efficient didactic tool**

*Noémie Robidas and Louise Mathieu*

Integrating into teaching pedagogical activities that encourage young violin players' decisional latitude, such as improvisation, appears to be a relevant way to lessen the constraints inherent to their psychosocial learning context. However, improvisation is almost absent from Western classical instrumental teaching and particularly from violin teaching. Moreover, pedagogical or didactical materials that offer a progressive approach to the teaching of improvisation in the context of Western classical music are rare and unsuited to the context of individual violin teaching. Our research aims at filling this gap by designing a didactical tool to help teachers integrate improvisation into their individual classes in the first three years of learning. This article describes the methodological approach we used to design a didactical tool that would meet the needs of both teachers and researchers.

### **Epidemiology of musician's dystonia: Experience from the London clinic, 2002-07**

*Karin Rosenkranz, Katherine Butler, and Aaron Williamon*

Musician's dystonia is a movement disorder presenting as incoordination, involving single or several fingers. The symptoms are either highly task-specific and occur only during playing, or involve other fine motor tasks, such as writing. It is unclear whether there are epidemiological differences between highly task-specific and the non task-specific form of musician's dystonia, which may indicate a different pathophysiology. We review epidemiological data of 124 musician's dystonia patients (86 male/38 female) seen in London during 2002-07. We compare the variables gender, age at symptom onset, professional position, instrument, and music style in highly task-specific (n=83) and non task-specific cases (n=41). The results strongly suggest a difference in the epidemiology. The *task-specific* form shows distinctive features, such as a significantly earlier onset, relative specificity for practice-intensive instruments (keyboard, plucked string) and predominance for classical musicians. The *non-task-specific* cases appear to be more similar to other forms of focal hand dystonia, such as writer's cramp. We suggest that the amount and intensity of musical training may be a crucial pathophysiological factor in the task-specific form of musician's dystonia but is less important in the non task-specific form.

### **The tuned brain: Enhanced brain plasticity in musicians**

*Karin Rosenkranz, Aaron Williamon, and John C. Rothwell*

Playing a musical instrument at a professional level is one of the most complex skills a human can achieve and is the result of intense practice started at an early age. It has been shown previously that the musician's brain adapts to this demand by changing its structure in brain areas involved in musical practice, such as the motor cortex. In the present study, we show that long-term musical training also influences the way in which the motor part of the brain regulates its own excitability and changes the strength of synaptic connections. These findings suggest that activity in the motor part of the brain is more precisely "tuned" in professional musicians than in non-musicians, which most likely supports their excellent motor skills.

**Sensory immersion training for concert artists**

*Joseph M. Sanders*

This advanced training program aims to train stage artists to identify and reverse the narrowing sensory reactions typical of fear. The resultant sensory re-conditioning tends to increase stage wellbeing and enhance the communicative and creative qualities of musical performance. I have generated early drafts of appropriate teaching materials. This essentially practical method for combining focal and peripheral sensory attention suggests a clarification and redefinition of the general concept of concentration. The resulting sensory immersion appears not only to reduce fear, but also to form an essential foundation for the full personal engagement characteristic of high level musical performance. Following on from a 2-year research project at the Guildhall School of Music and Drama (GSMD), 2005-07, I am currently launching a 1-year collaborative experimental venture between GSMD and Goldsmith's College to investigate scientifically the hypothesis that spreading visual and/or auditory spatial attention tends to deactivate the fear responses; it is jointly funded by GSMD and the London Centre for Arts and Cultural Enterprise (LCACE).

**The learning of music as a means to improve mathematical skills**

*Carlos Santos-Luiz*

Music improves the development of our brains and helps to improve our abilities in other subjects such as reading and mathematics. From simple sums to complex functions, mathematical concepts form part of the world of music. Because of this connection, it is possible to establish a positive correlation between participation/performance in music and cognitive development in mathematics. Gardner's theory of multiple intelligences incited several researchers to re-examine the relationships between musical experiences, music learning, and academic achievement. The majority of studies have found that the most significant relationships are between music and mathematics, or to be more specific, between music and spatial-temporal reasoning (important in mathematical concepts), and music and performance in reading. With regard to the former relationship, the inference is based on a group of studies which explore the effects of learning to play the keyboard on spatial-temporal reasoning, suggesting that mastering a musical instrument helps one to develop an understanding of mathematics. Furthermore, neuroscientific research has been carried out which associates certain types of musical practice to the cognitive development of humans.

**From quantitative empiri to musical performology:  
Experience in performance measurements and analyses**

*Jan Tro*

The term performology is introduced to describe the performer's "attempted control" of an acoustical instrument or a sound device. Four examples of performance analyses are discussed, three based on repeated MIDI recordings (Yamaha Disklavier grand and upright) and the last one based on repeated anechoic flute recordings.

**Assessing the importance of visual/theatrical features  
in the perception of music by an audience, using sociological tools**

*Teresa Vila Verde*

This paper discusses the interaction of music with an audience, in the specific context of a live performance. This issue is tackled in two complementary directions. Firstly, I propose that musicians should look inside the theatrical universe to find new paths to perform music, especially the contemporary repertoire. This theatrical influence intends to expand the visual dimension of a performance into a more global and flexible perspective. Secondly, I propose the use of sociological methods of analysis to assess the audience's perception of those performances, thus emphasizing the natural context of its production and reception to collect data. The final aim of this study is to contribute towards closing the composer-audience gap, created by modernism in the 20<sup>th</sup> century.

# Thematic Sessions

## PRACTICING PERFORMANCE

### Unresolved dissonance? Subjectivity in music research

*Roger Chaffin and Mary Crawford*

Psychologists want to know about musical expertise for two reasons. First, expert music performance is one of the highest human accomplishments, combining body knowledge, memory, and creativity in a way that very few other achievements can match. Second, knowledge of how musical expertise develops and how it works in real-time performance could be useful to musicians themselves. To that end, our research group has developed unique methods that integrate the perspectives of researcher and performer. However, researchers and performers tend to have different personal standpoints, ways of thinking, and goals. When psychologists and performers work together to understand musical expertise, these differences need to be addressed and the inevitable conflicts must be resolved.

### Variability and automaticity in highly practiced cello performance

*Tânia Lisboa, Roger Chaffin, Topher Logan, and Kristen Begosh*

*Performance cues* are the landmarks of a piece of music that a performer attends to during performance. While most aspects of a performance become automatic with practice, performance cues provide the musician with a means of conscious control of otherwise automatic motor sequences. Experienced performers strategically select the performance cues that they need to attend to during performance in order to achieve the musical and technical effects that they want. Previous evidence for this claim has come from practice and recall. This study examined effects of performance cues on live and practice performances. We recorded the practice and public performances of an experienced cellist learning the *Prelude* from J.S. Bach's *Suite No. 6* for solo cello over a two-year period. We measured bar-to-bar fluctuations in sound-level and tempo for 8 practice, 7 live, and 12 "lab" performances, the latter played with exaggerated, normal, or minimal expression. Expressive and interpretive performance cues were consistently associated with slower tempi and lower sound-levels. These effects were larger in exaggerated than in minimally expressive lab performances, and there were similar differences between the live performances. The effects suggest performance cues provide a way of controlling highly practiced performance.

### The effect of retrieval cues developed during practice and rehearsal on an expert singer's long-term recall for words and melody

*Jane Ginsborg and Roger Chaffin*

We examined a singer's recall for the words and melody of a work with small ensemble and investigated the extent to which this was predicted by practice and rehearsal 18, 32, and 42 months earlier. The singer video-recorded nine practice/rehearsal sessions with the conductor as accompanist over four weeks. She subsequently noted the locations of decisions made during practice (musical features) and those that were retained as cues for retrieval when the piece was performed (individual and shared performance cues). Regression analysis showed that these determined the nature and amount of practice and rehearsal. Crucially, distance from musical features and performance cues also affected recall, suggesting that different kinds of practice influence the way they function as "landmarks" and "triggers."

## PERFORMANCE ANALYSIS I

### Performance motives: Analysis and comparison of performance timing repetitions using pattern matching and Formal Concept Analysis

*Neta Spiro, Nicolas Gold, and John Rink*

A method combining a pattern-matching approach with Formal Concept Analysis is used to explore repeated timing patterns in performance in order to analyze characteristics of performances and differences among them. Initial analysis of timing data from performances of Chopin's *Etude Op. 10, No. 3* suggests that repetitions in timing patterns occur in several contexts: with motivic material identifiable in the score, with the same structural positions, in parts played very quickly, and not directly coinciding with any of the above. The paper explores the relation between these contexts and the roles of such repetitions in different performances of the same piece.

**The role of timbre in expressive musical performance:  
A case study of Bach's *Prelude* BWV 998 played on the acoustic guitar**

*Andrew Earis and Patricia Holmes*

This study explores the measurable properties of expressive timbre through recordings of Bach's *Prelude* BWV 998 played on the acoustic guitar. A number of "test" recordings were made, whereby each note throughout the passage was played with a different right hand fingering technique (varying the location of the plucking fingers along the length of the strings and the balance of flesh and nail in the attack). Using the fast Fourier transform, comparisons in spectral energy distribution were made between the different test recordings at the whole bar and individual note levels. Analysis of the test recordings showed a clear quantitative difference in spectral sound quality according to the right hand fingering technique employed. A number of "natural" performances were then recorded and analyzed in the same way and these data compared to the test recordings, in order to establish the right hand fingering technique used for each note played, and the results were illustrated graphically on a piano roll-type score. Thus, the objective study of expressive timbral variation can be achieved.

**Tendencies of piano interpretation in the twentieth century:  
Concept and different types of "piano interpretation schools"**

*Sofia Lourenço*

The aim of this paper is to consider whether the concept of a "piano interpretation school" is a useful concept from which to analyze the quality and development of Western classical piano performance. It is possible to trace lines that seem to share certain common characteristics—namely, aesthetics, technique, history, and the commonly learned and performed repertoire. Throughout my career, I have noticed the coexistence of different tendencies in the tradition of piano performance, the most common being the "Russian School" and "German School." Each seems to define a certain approach to general playing and/or specific repertoire, involving characteristic sonority, favored repertoire, specific tempi, use of pedal, different piano constructors, pedagogical methods, and technical interpretive approaches (use of rubato, polyphonic clearness, etc.). The concept of the "piano interpretation school" needs to be questioned and discussed, not only for analysis and systematization, but also for the subjectivity it allows. The privileged relationship of the master and student, through the transmission of certain performing approaches and repertoire selections, as well as through the transmission of technical resources, can support the definition of a certain school of piano interpretation. This paper ends by discussing this teacher-student legacy.

**SCIENCE OF THE VOICE**

**Voice source and acoustic measures of girls singing  
"classical" and "contemporary commercial" styles**

*Chris Barlow, Jeannette LoVetri, and David Howard*

The understanding of the singing voice of children and adolescents is still in its infancy, and there is a lack of a general developmental model of the young voice, in particular with relation to young singers. Available research has largely also been on "classically" trained voices, and contemporary commercial music (CCM) including pop/rock and musical theatre has largely been ignored. This study examined laryngographic and acoustic analysis of 10 young female singers, aged 14-17, training using a system which includes both classical and CCM techniques, particularly musical theatre (MT). Singers were found to have generally lower vocal fold closed quotient (CQ) at most pitches when singing in an MT style than in a classical style. The spectral slope was also found to be generally shallower for MT singing than classical, particularly over F0-F5.

**Choral singing and psychological wellbeing:  
Findings from English choirs in a cross-national survey using the WHOQOL-BREF**

*Stephen Clift, Grenville Hancox, Ian Morrison, Bärbel Hess, Gunter Kreutz, and Don Stewart*

Over 600 choral singers drawn from English choirs completed the WHOQOL-BREF questionnaire to measure physical, psychological, social, and environmental wellbeing, and a 12-item "effects of choral singing scale." They also provided accounts of the effects of choral singing on quality of life, wellbeing, and physical health in response to open questions. High average scores were found on all WHOQOL-BREF scales, and a high degree of consensus emerged on the positive benefits of choral singing, but substantial variations were also found. Within a group of participants with relatively low psychological wellbeing and strong perceptions of positive benefits associated with choral singing, four categories of significant personal and health challenges were found: enduring mental health problems;

significant family/relationship problems; significant physical health challenges; and recent bereavement. Their accounts also revealed six “generative mechanisms” by which singing may impact on wellbeing and health: positive affect; focused attention; deep breathing; social support; cognitive stimulation; and regular commitment.

### **The effects of the menopause and the use of hormonal replacement therapy on the female professional voice users’ perceptions**

*Filipa Lã, Nancy Lee Harper, and João Luis Silva Carvalho*

During the menopause, concentrations of estrogens and progesterone fall significantly, and the ratio of estrogen to androgen becomes androgen dominant. Elevated concentrations of androgens have been associated with negative effects on female voices. For those women whose careers depend on their voices, even mild vocal changes may significantly affect professional wellbeing and quality of life. This research explores female professional voice users’ perceptions of vocal variations associated with the menopause and hormone replacement therapy (HRT) use, as well as implications for career management and professional wellbeing. Semi-structured interviews were carried out with five post-menopausal female professional voice users with different vocal backgrounds. Questions focused on (1) vocal quality, (2) self-identity and self-esteem, (3) career management, (4) professional quality of life and general wellbeing, and (5) opinions and feelings toward HRT use. The results highlight the importance of undertaking further research on the effects of climacteric hormonal variations and HRT use on the professional voice. With our ageing population, it is likely that more menopausal women will seek to maintain effective communication skills across their careers, with those whose careers depend on their voices meriting special concern.

## **LEARNING AND TEACHING I**

### **Diary of a child musical prodigy**

*Gary E. McPherson*

This study involves a longitudinal investigation of an exceptionally talented 10-year old female pianist who was first interviewed when she had just turned 7 years of age. The research attempts to document a range of factors that impact on the child’s learning. Of particular interest are the child’s personal learning agenda which guides her mastery of difficult repertoire and the support she receives from her parents and significant others. Associated areas of investigation include her exceptional aural and memorization skills and her ability to master challenging repertoire either by ear or from notation. The self-regulated strategies she employs to monitor and control her learning, especially during the preparatory stages when she is about to start learning new repertoire and the methods she uses when practicing, are also areas that are being investigated.

### **The influence of the wider context of learning, gender, age, and individual differences on adolescent musicians’ performance anxiety**

*Ioulia Papageorgi*

To date, most research on musical performance anxiety has focused on adult professional musicians, disregarding how anxiety might affect younger performers. As a result, a clear understanding of how it develops in adolescent musicians and which performers are more prone to it has not yet been established. The aim of this study was to explore the influence of the wider cultural context of learning, gender, age, and individual differences on adolescent musicians’ experiences of performance anxiety as evidenced through their self reports on a newly-developed self-report questionnaire and the Adolescent Musicians’ Performance Anxiety Scale (AMPAS). Participants included 410 young musicians between the ages 12-19 in two geographical locations (UK and Cyprus). Results from statistical analyses suggest that the wider context of learning, gender, age, personal characteristics, and individual differences arising from self-concept, self-efficacy beliefs, susceptibility to situational factors in performance, and parental expectations should be taken into account when assessing performance anxiety in adolescent musicians and within educational settings.

### **Composing with *Hyperscore* in general music classes: An exploratory study**

*Graça Mota, Daniel Gonçalves, Ana Daniela Oliveira, António Sousa, Fernando Calheiros, and Helena Ribeiro*

This paper presents the first report of an exploratory study involving the use of the software *Hyperscore* in general music classes as a mean to facilitate musical understanding and conceptual transferability from a technology mediated music learning context to the normal music classroom setting. It was developed in one school in three classes of 26 children each, 10 to 13 years old, in the context of pre-service music teacher training under the

supervision of the Department of Music Education of the Porto College of Education. Between December 2006 and May 2007, the three classes were involved in music education both in a room provided with one computer with headphones for each child and the software *Hyperscore*, and in the normal music classroom environment. Using mainly a qualitative, exploratory, and participant research methodology, data collected involved children's files and evaluation sheets, teachers' written observations, and interviews. Preliminary findings reveal high levels of task centered behavior, autonomy, and collaborative attitudes, as well as a more conscious use of musical vocabulary. Given the strong appeal of the graphical composition system, further studies are needed in order to establish a clear link between the child's musical intentions and the pictographic outcomes.

## **PERCEIVING PERFORMANCE**

### **Intended versus perceived emotion**

*Cristina Capparelli Gerling and Regina Antunes Teixeira dos Santos*

This paper reports the preliminary results of an activity involving the communication of intended and perceived emotions. Six male students were requested to present their interpretation of the piece *Tempo Livre* (Free Time) after practicing for ten days. The participants were instructed to mobilize their store of musical procedural knowledge in order to convey an intended emotion. Eight other students were requested to write down their perception of each of the six individual performances. Results show that communication does not correlate with years of musical study and that there is a pointed divergence between intended and perceived emotions.

### **Golden Section in the sonatas of Domenico Scarlatti: An examination of Kirkpatrick's crux**

*Nancy Lee Harper*

More than fifty years ago, performer-musicologist Ralph Kirkpatrick (1911-1984) observed a compositional phenomenon in the bi-partite sonatas of Domenico Scarlatti (1685-1757), which he termed "crux" or the point in each half where the thematic material at the ends of both halves establishes the closing tonality. The crux is thus a device with a triple function: melodic, harmonic, and structural. To date, there has never been systematic study of the position of the crux in the Scarlatti sonatas. Therefore, the main objective of this study is to examine the relationship of the position of the crux in two bodies of contrasting Scarlatti sonatas—the *Essercizi* (published 1738-1739) and the *Cantabile* sonatas—using the Golden Section (GS) as a measuring tool in order to determine (a) if GS exists and (b) if so, what are the implications.

### **Making sense out of taste: A study on listeners' preferences of performed tonal music**

*Ângelo Martingo*

Prior investigation by the author shows Lerdahl's concepts of tension and attraction to be an efficient tool for understanding performed expressive deviations. This paper reports a follow-up perceptual investigation of that study in which listener's preferences are examined in the light of the performance expressive strategies previously identified. University students were asked to rate on a seven-point scale the coherence, control of timing, control of dynamics, expressivity, tension, fluency, and global evaluation of recorded interpretations of Beethoven's Op. 53 (nine initial measures of the second movement) in which the existence or not of significant correlations between timing and dynamics as well the existence or not of significant correlations between expressive deviations and music structure had been identified in prior research. Results show that interpretations in which such correlations occur are rated systematically higher than interpretations in which such correlations are not the case.

## **PERFORMANCE PRACTICE**

### **How singers influence the understanding of sung text**

*Philip Fine and Jane Ginsborg*

Singers differ from other instrumental performers in that they generally combine words with music, as song. Diction is an important aspect of vocal pedagogy, since the singer's foremost responsibility is perhaps to communicate the text and its meaning to the listener, whatever the language being sung. This study investigated the factors that are perceived to affect this communication process. We surveyed 143 singers, singing teachers, and listeners to choral and vocal music, asking them to list those factors they felt affected text intelligibility. In all, 43 factors were identified, of which 15 related to the performer (i.e. 33% of all statements made). These included those factors under the performers' control, such as diction, technique and training, stage presence, and breathing and phrasing. Singing teachers made more performer-related statements than other respondents, and the more important respondents

deemed it to be able to understand the text in a familiar language, the more performer-related factors they listed. Thus, the performer is seen to influence sung text intelligibility in a number of ways. Knowing more about these factors can inform vocal pedagogy, particularly diction, technique, and communication with the audience. Future research will investigate some of these factors in a more objective, controlled way.

**Effects of musical texture, performer's preparation, interpretative goals, and musical competence on error patterns in organ performance**

*Bruno Gingras, Stephen McAdams, and Peter Schubert*

This study compared the influence of musical texture (homophony versus contrapuntal writing), conditions of preparation (sight-reading versus prepared), interpretative goals, and level of competence (results in organ performance competitions) on the type and number of errors that are committed in organ performance. In the sight-reading condition, eight professional organists recorded different interpretations of two short Baroque organ pieces of contrasting texture. In the prepared condition, 16 organists made two recordings of J.S. Bach's organ fugue in D minor (BWV 538). Results show that musical texture has a strong effect on the type of errors: substitutions and intrusions tend to be more contextually appropriate when the musical setting is mostly homophonic than when it is contrapuntal. Interpretative goals also affect the distribution of errors: organists make fewer errors for the notes belonging to the voice that they are trying to emphasize. In addition, the error rate is higher for notes belonging to inner voices and is positively correlated with onset density. Finally, although musical competence had no significant effect on error rate in sight-reading conditions, the prize-winning performers made significantly fewer errors in the prepared condition.

**Cognitive feedback and metaphors in emotional communication instruction of musical performance**

*Nuno Arrais and Helena Rodrigues*

The use of metaphorical language is a common strategy in music teaching. Nevertheless, there is a lack of scientific knowledge about this subject. Inspired by earlier studies on cognitive feedback, emotion, and performance, an experiment was designed in order to test the metaphorical impact in the improvement of musical emotional communication. Two kinds of language were set: (1) technical, used in cognitive feedback studies, and (2) metaphorical. These were separately applied to two groups of violin students through a cognitive feedback process in order to make them communicate a specific emotion. Their performances were recorded and submitted to acoustical analysis as well as being evaluated by a set of judges. Results indicated that after only one session both languages improved students' performance and their emotional communication skills. Demonstrating that metaphors are efficient tools to learn musical expressivity, this study contributes to the research of metaphorical language use in a musical context and also to the knowledge about traditional teaching processes to enhance emotional communication.



**Abstracts**  
**Friday, 23 November 2007**

# Keynote paper

## **Enhancing music and dance performance with EEG-neurofeedback**

*John Gruzelier, Joe Leach, Tony Steffert, and Trevor Thompson*

We have demonstrated professionally significant enhancements in music and dance performance through EEG-neurofeedback training, where participants learn to control selected brain rhythms through a real time biofeedback process. In our laboratory, other “peak performance” applications in healthy subjects have included attention, memory, and microsurgical skills. These results are reviewed, and new controlled studies are outlined. Earlier results with Royal College of Music students have been extended to novice singing abilities, first in Trinity College of Music instrumentalists, and second in Goldsmiths adult education blues and gospel singers. Slow wave and fast wave EEG training protocols were compared for effects on established song and instrumental repertoire and on improvisation. A study of dance performance is outlined, extending an earlier study with university competitive Latin and ballroom dancers to first year students at the Laban dance conservatoire. EEG slow wave training and heart rate variability coherence training, both successful with ballroom dancers, were compared with kinesthetic instruction. Aside from music and dance, performance outcome measures include cognitive assessment, including creativity and mood and personality.

# Thematic Sessions

## **MUSICIANS' HEALTH**

### **Orofacial considerations concerning musicians**

*Miguel Pais Clemente, Inês Carvalho, Mário Vasconcelos, Rogério Branco, José Cavalheiro, and José Frias-Bulhosa*

Orthodontic problems, soft tissue trauma, focal dystonia, denture retention, herpes labialis, dry mouth, and temporomandibular joint (TMJ) disorders were identified as orofacial problems of career musicians. The most prevalent problems affecting wind players involve overuse of muscles resulting from repetitive movements of playing, especially because it requires increased ventilation and increased orofacial muscle activity. Therefore, we have developed the Lip Pressure Appliance (LPA). It consists of a lip protector made in one piece, which has been manufactured from a relatively flexible thermoplastic material and configured and fitted to the lower dental arch of the player who uses it. In addition to this, many patients who are doing orthodontic treatment face difficulties when playing because of the pressure against the orthodontic brackets. We have developed therefore yet another protector, the Orthodontics Lip Pressure Appliance (OLPA). The movement of the teeth during the orthodontic treatment has been predicted and with different combinations of materials it was possible to leave a space for the teeth movement without losing retention of the OLPA. This way people who have doubts about orthodontic treatment because of their musical career have the problem solved.

### **Joint hypermobility is a liability for the performing artist**

*Rodney Grahame*

Joint hypermobility is defined as a range of joint movement that is considered excessive, taking into consideration the age, gender, and ethnic background of the individual, being greater in women and in those of Asian origin compared with other ethnic groups. All newborn babies can be considered to be hypermobile, but the range of movement diminishes progressively during childhood and then more gradually during adult life. Elderly hypermobile people have retained many facets of their hypermobility throughout life. Originally perceived to be a feature of rare inherited diseases such as Marfan and Ehlers-Danlos syndromes, it was only in the 1960s that hypermobility syndrome was seen to exist apart from these diseases and as an entity in its own right. In the early 1970s it was first linked to ballet dancers. There is now evidence that it represents a risk factor for injury in performing artists in general.

### **The role of retraining in rehabilitation from focal dystonia**

*Rae de Lisle, Dale Speedy, and John Thompson*

Focal dystonia is a debilitating movement disorder which occurs as a result of many repetitions of a specific task and typically manifests in involuntary muscle contractions. In pianists, an incoordination occurs between fingers, making it impossible to play at concert level. Three pianists with focal hand dystonia participated in a retraining program based on a biomechanically sound way of playing with minimal tension. Quality of scales and repertoire were assessed before and after pianism retraining by several rating systems and included assessment by a listener blinded as to which hand was dystonic and whether they were assessing playing pre- or post-retraining. Scale quality improved with retraining in all three pianists, with improvement in both hands, but greater in the dystonic hand. While there was no change in the blinded listener being able to identify the non-dystonic hand from pre-training to post-training, they could correctly identify the dystonic hand 79% pre-retraining, but this decreased to 28% post-retraining. The test repertoire evaluation and the visual evaluation rating were shown to improve significantly by 1.0 and 1.3 points, respectively (on a five point rating scale), from pre-training to post-training.

## **PSYCHOLOGY OF PERFORMANCE**

### **Theoretical and practical applications of mental imagery**

*Melanie J. Gregg and Terry Clark*

Mental imagery is used extensively by musicians as well as by athletes in sport. As performers, musicians and athletes strive to achieve excellence. Preparation is an essential precursor to performance and the use of mental imagery is a common method of achieving this state. In the sport psychology literature an applied model of imagery use has been proposed, the model suggests that the sport situation (i.e. training, competing, rehabilitation) will dictate the function of imagery used (e.g. arousal regulation, skill rehearsal), and this in turn will impact the outcome (e.g. feelings of efficacy, technique). Relevant mental imagery research in sport and music is reviewed, making links across the disciplines in an attempt to inform research and practice. The applied model of imagery use in sport guides the development of a similar applied model of imagery use in music.

### **What does mental imagery mean to university music students and their professors?**

*Elizabeth Haddon*

The *Investigating Musical Performance* research project was devised to explore how musicians develop their learning about performance in undergraduate, postgraduate, and wider community contexts. Analysis of questionnaire data from 264 respondents revealed that mental rehearsal was the least popular aspect of musical learning, but verbal data from case study interviews showed that student musicians used musical imagery in various ways and ascribed many meanings to the term. This paper, through a short, specially devised questionnaire, explores how undergraduate musicians at the University of York and their professors use musical imagery. Many reported using it for specific musical activities such as practice, composition, performance, and thinking music in the mind for pleasure, although it was not necessarily a developed skill. Because the benefits are significant, it is proposed that imagery work should become a more formal part of musical training rather than a peripheral part of musical experience.

### **Measuring self-efficacy in music**

*Laura Ritchie and Aaron Williamon*

For the musician, belief in one's abilities is of paramount importance to performance success. A fully comprehensive means of measuring musical self-efficacy, however, has yet to be devised and validated. This paper reports a pilot of three new instruments for measuring musical self-efficacy beliefs. Fifty-three tertiary music students completed three questionnaires pertaining to (1) *general* musical self-efficacy, as well as self-efficacy beliefs relating *specifically* to (2) musical learning and (3) performing. The questionnaires were shown to be robust, each achieving a high score for internal consistency. Summative scores were created casewise for each questionnaire, and correlations were found between self-efficacy scores and the self-regulated learning behavior "seek advice from peers, teachers, or others," as measured using a new self-regulated learning questionnaire. Students were significantly more self-efficacious for learning than for performing, and scored lower still on the general scale. Each of these measures correlated with students' self-rated abilities on a range of musical skills and attributes, including musicality, level of perseverance, and the ability to manage stage fright.

## PERFORMANCE ANALYSIS II

### **Virtuosity: Some (quasi phenomenological) thoughts**

*Francisco Monteiro*

This main goal of this paper is to discuss music performance in terms of what is called virtuosity. There is a certain view of music performance that gives emphasis to what the public and music theorists call “virtuosity in music”. It appears that certain performances—of *virtuosi*—are more relevant, more accurate, more expressive, more fluent, more impressive, more (or less) something. Even certain music works apparently were design to be played specifically by virtuosi: to be performed with virtuosity. This paper proposes a possible phenomenological, social, and cultural approach to virtuosity, suggesting definitions, implications, and different types of virtuosity. It recalls the ideas of theorists (Adorno, Kant, José Gil, Merleau-Ponti) and of music aesthetics (Jankelevitch, Brelet, Rahn, Collins) concerning performance, musical works, and virtuosity. In doing so it confronts anthropological theories, semiotics, and the multiple music practice, proposing different kinds and different ways to understand virtuosity. It also questions the values and the use of this noun as meaningful in terms of music theory, or simply indicative of a tendency when understanding music performance.

### **The art of hand-splitting: Vianna da Motta’s contribution toward a better rendering of Beethoven’s sonata op.31/2**

*Luís Pipa*

Vianna da Motta’s note-distribution in Beethoven’s sonata op.31/2 alters the composer’s original notation in a significant manner. The discussion lies on whether these changes may help to emphasize the musical intentions or if by facilitating the execution of some passages, the musical result may be subverted. While some pianists simply object to this practice, others believe it may bring advantages in the sense that by reducing the technical difficulties of a particular passage one can better concentrate on the musical result. Through the analysis of some of the most relevant of Vianna da Motta’s hand-splitting solutions it is concluded that they are an objective vehicle toward a better rendering of the work both technically and musically, providing at the same time fertile ground for further individual findings.

### **Fernando Lopes-Graça’s choral music: Characteristics and interpretation**

*Jorge Matta*

Fernando Lopes-Graça’s choral music was frequently performed with harshness. His connection to traditional music, his ideology and that of most choirs who performed it, and the influence of his politically-engaged songs gave rise to a style of interpretation that often had nothing to do with the music itself. On the basis of the analysis of some of his vocal compositions, this paper attempts to demonstrate that Lopes-Graça was, in most cases, a composer full of lyricism, a sensitive conveyor of natural, social, and poetic atmospheres, who has often been interpreted in an inaccurate and artificial way. This paper is based on the analysis of parts of the works *Quatro Redondilhas de Camões*, *Dos Romances Velhos*, *Três Esconjuros* and *Para as raparigas de Coimbra*, using musical examples from recent CD recordings by the Gulbenkian Choir. The way Lopes-Graça handles dissonance must, in most cases, be regarded as a sequence of colors, a subtle conveyance of emotional atmospheres, and only secondarily as an alternation of tensions. Indeed, the very concept of dissonance must be reconsidered in terms of his own music.

# Graduate Award Paper

### **Neural correlates of professional classical singing**

*Boris Kleber, Ralf Veit, Niels Birbaumer, and Martin Lotze*

We evaluated cerebral activation maps of 43 subjects with respect to their classical singing skills. Professional opera singers, music conservatory vocal students, and medical students overtly sung parts of an Italian aria in a sparse sampling functional magnetic resonance (fMRI) experiment. Professional opera singers compared to medical students revealed increased activation in bilateral dorsolateral prefrontal cortex (DLPFC) and inferior parietal lobe (IPL, both pronounced in the right hemisphere), right primary somatosensory cortex (S1) in the somatotopic representation of the articulators, but also in the cerebellum and the thalamus. Vocal students compared to medical students revealed bilateral increased activation in the IPL, the DLPFC, and S1. Opera singers compared to vocal

students showed increased activation in the left caudate nucleus, the left cerebellum, bilateral DLPFC, and the medial dorsal and ventrolateral thalamus. A subsequent regression analysis was performed with the amount of weekly singing practice and showed practice dependent activation of DLPFC, bilateral IPL (pronounced in the right hemisphere), and S1. A further regression analysis excluding the opera singers showed left lateralized activation in the same regions. We conclude that experienced singers developed a specialized network for enhanced somatosensory processing and performance monitoring as well as motor sequence attention.

## Thematic Sessions

### PERFORMANCE ANALYSIS III

#### **The timbre vocabulary of professional female jazz vocalists**

*Daniela Prem and Richard Parncutt*

Female jazz singers have a large common vocabulary of timbre descriptors that indexes their practically oriented timbral knowledge. We aimed to explore and document that vocabulary by constructing an inventory of timbre descriptors and their physiological or technical correlates. A vocabulary of some 200 terms with definitions, synonyms, and antonyms was assembled from transcriptions of lessons and interviews with six professional jazz singer-teachers. The vocabulary includes such diverse terms as *Mickey Mouse*, *instrumental*, *natural*, *nasty*, *compact*, and *suspended*. Almost the same vocabulary was used to describe the vocal quality of commercially available recordings. During lessons, timbre descriptors tended to be less important than advice on style, breathing technique, and interpretation. Teachers used their timbral vocabulary intuitively and were often surprised when confronted with it in an interview. They used timbral descriptors to achieve interpretive goals, even if they did not fully understand the physics and physiology (e.g. ideas about voice “placement”). The results highlight musically important aspects of vocal timbre that are worthy of more detailed gestural and acoustical investigation.

#### **Authenticity in the twentieth century: Listening to composer’s own recordings**

*Rui Pedro Pereira*

The aim of this paper is to question the concept of both “authenticity” and “historically informed performance” by means of analyzing recordings of music composed in the twentieth century. Moreover, it attempts to shed light on the use of historical recordings for performance practice. Examples with recorded music by Grieg, Webern, Shostakovich, and Messiaen were analyzed, forming the basis for ascertaining how close from the composer’s intentions one might get. Recordings by several performers were chosen following a hierarchic model of “authority” by Robert Philip. The results indicated that the biggest differences between the composer’s interpretation and the interpretations by other performers occur when modern techniques of composition were used by composers whose interpretative style was rooted in the romantic tradition of performance. Generation gaps between performers were also observed as far as expressive deviation was concerned. It is concluded that both musical and cultural background play a fundamental role in the way works are performed and surpass the realms in which musical analysis can have an impact in performance practice.

#### **A prototype system for rule-based expressive modifications of audio recordings**

*Marco Fabiani and Anders Friberg*

A prototype system is described that aims to modify a musical recording in an expressive way using a set of performance rules controlling tempo, sound level, and articulation. The audio signal is aligned with an enhanced score file containing performance rules information. A time-frequency transformation is applied, and the peaks in the spectrogram, representing the harmonics of each tone, are tracked and associated with the corresponding note in the score. New values for tempo, note lengths, and sound levels are computed based on rules and user decisions. The spectrogram is modified by adding, subtracting, and scaling spectral peaks to change the original tone’s length and sound level. For tempo variations, a time scale modification algorithm is integrated in the time domain re-synthesis process. The prototype is developed in Matlab. An intuitive graphical user interface (GUI) is provided that allows the user to choose parameters, listen, and visualize the audio signals involved, as well as perform the modifications. Experiments have been performed on monophonic and simple polyphonic recordings of classical music for piano and guitar.

## **PHYSICALITY OF PERFORMANCE**

### **Biographical predictors of music-related motor skills in children pianists**

*Hans-Christian Jabusch, Raymond Yong, and Eckart Altenmüller*

This study aimed to identify biographical predictors of children pianists' motor skills in a relevant musical context. Motor skills at the piano were assessed in 30 piano-playing children by testing temporal evenness in standardized scale playing which is a basic element of piano technique. Questionnaires were used to collect detailed information regarding the practice habits and other biographical factors. Associations between performance values and variables from the questionnaire were investigated by multiple regression analysis. Besides the duration of piano education and the frequency of technical exercise, motivational factors and parental supervision predicted children pianists' motor skills in the selected motor task, i.e. in a relevant musical context.

### **The role of the Alexander technique in musical training and performing**

*Malcolm Williamson, Neil Roberts, and Andy Moorhouse*

Most students enter music conservatoires with long-standing inappropriate habits in their manner of using themselves in activity. These habits hamper the smooth operation of postural support systems, which are fundamental to all skilled movements. By learning and applying the Alexander technique (AT) individuals are able to avoid unwanted reactions. Performance improves and activities are seemingly effortless. The first scientific study uses a whole body Magnetic Resonance Imaging system (MRI and fMRI) to investigate reorganizations of the structure and function of the human body and, in particular, the brain during Alexander "directing." The second study is of student pianists playing scales. Key velocity and timing data are collected and analyzed to show a significant difference in touch before and after the AT lesson.

### **Kinesics analysis in the investigation of the emotion expression in music performance**

*António Salgado*

This paper discusses body language within musical performance and contributes to a theory of gesture as a practice within musical performance. Based on a point-light technique approach, empirical evidence has shown that the abstract movement of the point lights (resulting from the video recording of a series of facial movements while experienced singers expressed different emotions in singing performance) had sufficient dynamic information to be recognized by an audience according to the emotional intention performed by the singer. It seems, then, that performers, conscious or unconsciously, use physical gestures associated with emotional states and other expressive issues as a basis for shaping musical expression. Ultimately, it is possible to consider that bodily movements may function as indicators of expressive intentions of the performer and, when linked to important music structures, may also be seen as giving musical expression to emotional states presented through the music.

## **LEARNING AND TEACHING II**

### **PGCE music students' perceptions of the benefits of their musical involvement outside of school**

*Dimitra Kokotsaki*

This study aims to assess the perceived impact of PGCE (Post-Graduate Certificate in Education) music students' engagement in music making outside of school. It specifically attempts to uncover teacher trainees' attitudes toward their own music making, what kind of musical activities they are involved in, how they perceive these activities in terms of their value in their lives, their possible impact on the quality of their teaching, and the perceived satisfaction they get from their teaching as a result of their own musical engagement outside of school. Thirty-four music teacher trainees in secondary education were asked to report on the perceived impact that their participation in music making outside school had on their lives during their training and on its expected impact as a qualified music teacher. It was found that being musically involved outside of school has both personal and professional benefits for them: it increases their job satisfaction and helps them become better teachers. They all expressed a desire to be involved in such musical activities as qualified music teachers because they felt that these can help them maintain their enthusiasm, be more confident and motivated, and keep their technique and performance standards at a high level.

**A theoretical framework for examining foundational instructional materials supporting the acquisition of performance skills**

*Frank Heuser*

Conventional approaches to beginning instrumental performance instruction and the teaching materials supporting this process tend to stress technique acquisition and the ability to read written music. Available beginning level instructional materials tend to focus on skill development and note reading thereby doing little to facilitate the acquisition of functional aural skills, to create an awareness of tonality, or to help beginning students acquire the wide variety of conceptual understandings that might serve as a foundation to meaningful life-long engagement with music making. A framework mapping the multiple skills and concepts constituting musical knowledge and linking such maps to principles of instructional design might help music teachers construct more effective instructional materials. This paper uses concept mapping in developing such a theoretical framework.

**Youth and dance: Relation of university students with different types of dance**

*Ana Macara and Ana Paula Batalha*

In this paper, we present the results of a study examining the expectations of students beginning an undergraduate degree in dance and their relation to different types and activities in dance. In order to do this, we employed a specifically created questionnaire. We found that the dance students had already accumulated a significant amount of dance practice. Around half the group had practiced an average of seven years of ballet, while almost another half had practiced mainly street dances, though not for so many years. There are also other dance forms that had been practiced at some point by many of the subjects. Though they do not show much experience in other art forms, around one half had had some training in acting. More than a third of the group had worked as dancers, and a few as dance teachers. Expectations about the degree were mainly related to developing their performing qualities, showing little interest for the importance of theoretical studies. This is certainly related to the social lack of recognition of the necessity of higher education for teaching dance, since many teachers are previous dancers with little education in teaching.



## Portuguese Catholic University, Porto

Formed in 2004, the Research Center for Science and Technology in Art (CITAR) is integrated into the School of Arts of the Portuguese Catholic University (UCP) under the terms of the *Portuguese Foundation for Science and Technology's* pluriannual funding program. The overall aim of CITAR is to carry out multidisciplinary research and development across science and technology in art, particularly in the fields of digital arts, audiovisual design, music, and conservation and restoration of art and heritage.

## Royal College of Music, London

The Royal College of Music (RCM) is one of the world's leading conservatoires, providing specialized musical education and professional training at the highest international level for performers and composers.

The Centre for Performance Science (CPS) was established in 2000 with the aim of fostering collaborative research and teaching among musicians and scientists at the RCM. From the investigation of music cognition and perception to the study of expert performance, the CPS benefits from its position within a vibrant musical environment. As such, the Centre is particularly well placed to explore the interface between skilled artistry and scientific discovery.

## Casa da Música

Casa da Música is Porto's iconic new performance venue, described in the *New York Times* as "one of the most important concert halls built in the last 100 years".

Designed by the Dutch architect Rem Koolhaas as a European Culture Capital project, it opened in 2005. The building houses two auditoria, rehearsal rooms, and recording studios, as well as numerous flexible spaces for temporary exhibits and other musical, educational, and cultural projects.

## Porto

Referred to as Portugal's *Capital of the North*, Porto was selected as the 2001 European Capital of Culture. Historic references of the city stretch back to Roman times, although Celtic and pre-Celtic remnants of ancient citadels have been found at the heart of where Porto now lies.

The city gained historical importance in the Fourteenth and Fifteenth Centuries as its shipyards contributed to the development of the Portuguese fleet. It is known largely for its trade in Port wine, named after the city because it was originally shipped from the area.

Today, Porto is admired for its enterprising spirit and characteristic culture. Visitors will see an array of architectural gems from Roman, Gothic, Baroque, Neoclassic, and Renaissance eras in this scenic city built into the granite cliffs at the mouth of the River Douro. Ribeira, the historic centre of Porto, was declared a World Heritage Site by UNESCO in 1996.

## **Announcement of ISPS 2009**

**The next  
International Symposium on Performance Science  
will take place in 2009 at the**

**National Institute of Creative Arts and Industries  
University of Auckland  
New Zealand**

**The date and first call for papers  
will be announced soon at  
[www.performancescience.org](http://www.performancescience.org)**